UNIVERSAL MODEL AIRPLANE NEWS

SEPTEMBER

20¢

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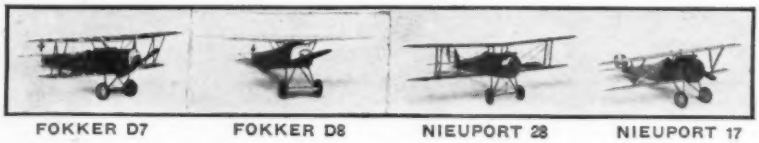

FOKKER D7 FOKKER D8 NIEUPORT 28 NIEUPORT 17

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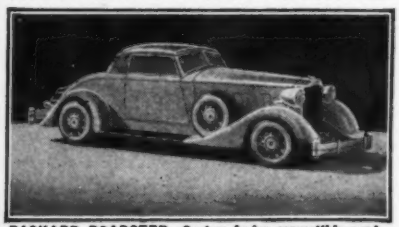

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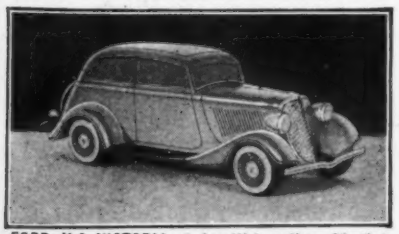

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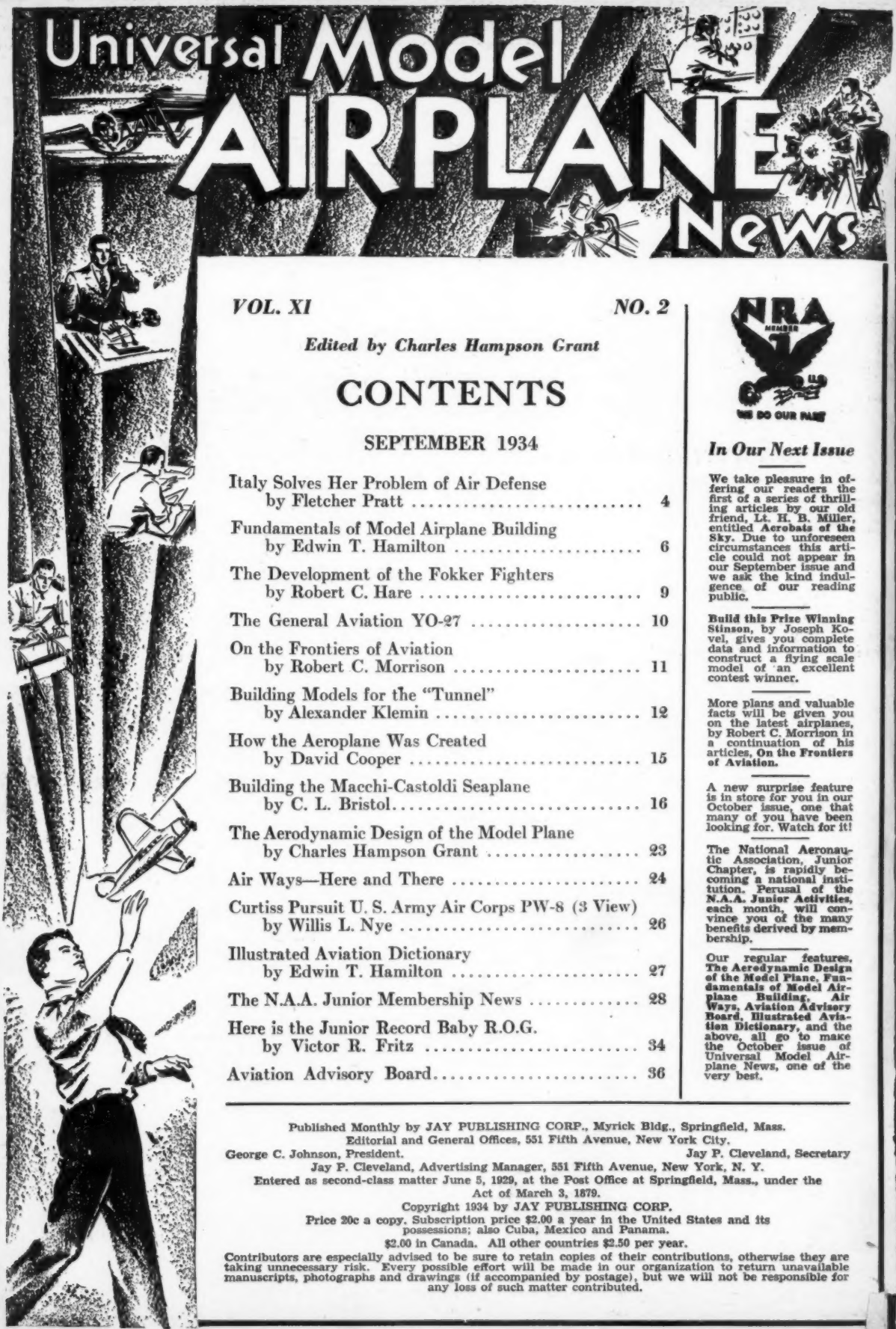

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Edited by Charles Hampson Grant

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In Our Next Issue

We take pleasure in offering our readers the first of a series of thrilling articles by our old friend, Lt. H. B. Miller, entitled **Acrobats of the Sky.** Due to unforeseen circumstances this article could not appear in our September issue and we ask the kind indulgence of our reading public.

Build this Prize Winning Stinson, by Joseph Kovel, gives you complete data and information to construct a flying scale model of an excellent contest winner.

More plans and valuable facts will be given you on the latest airplanes, by Robert C. Morrison in a continuation of his articles, **On the Frontiers of Aviation.**

A new surprise feature is in store for you in our October issue, one that many of you have been looking for. Watch for it!

The National Aeronautic Association, Junior Chapter, is rapidly becoming a national institution. Perusal of the **N.A.A. Junior Activities,** each month, will convince you of the many benefits derived by membership.

Our regular features, **The Aerodynamic Design of the Model Plane, Fundamentals of Model Airplane Building, Air Ways, Aviation Advisory Board, Illustrated Aviation Dictionary,** and the above, all go to make the October issue of Universal Model Airplane News, one of the very best.

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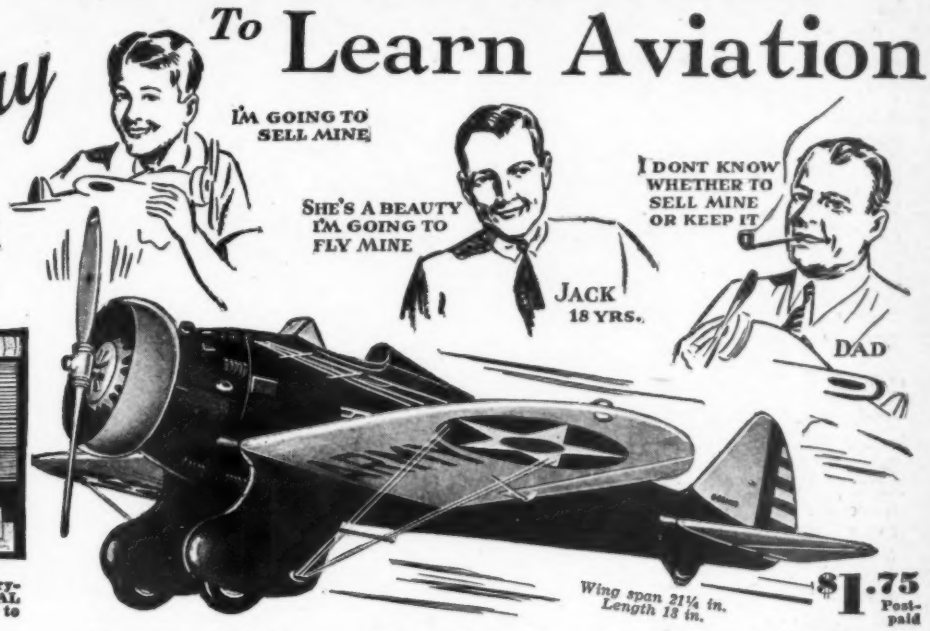

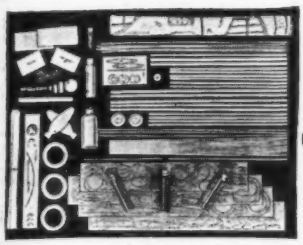

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Boys, how would you like to have an experienced flying man sit down with you at your bench and help you lay out a real working model Boeing P-26A? One of the newest, most advanced of all fighting planes. Fast, speedy, with full armament capable of over 240 miles per hour. This flying model is an exact replica of this famous fighter and flyer—one that is identical in all but size with its noteworthy big brother. That's exactly what the IDEAL AIRPLANE AND SUPPLY COMPANY is doing for you. We have had experienced flying men who have spent their lives in designing and flying real planes lay out this Boeing P-26A for you! And they did it in a way that is so simple that any boy can build it.

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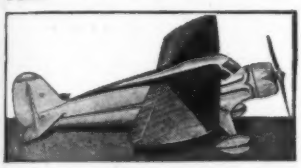
Built in exact ¾ inch scale, this kit contains everything necessary to build a big, workmanlike model with a wing span of 21¼ inches, and a length of 18 inches. Finest materials only are used in its construction: sheets of selected plainly printed balsa of a quality not ordinarily found in a kit at this price; balsa strips of various sizes for its skeleton ribs, etc.; sheets of silk tissues, cement, both colored and plain dope, propeller shafts, 2 propellers, motor plate, rubber motor, wheels, cable cord and all other hooks, pulleys, control hinges, eyelets, washers, sand paper, celluloid, reed, wire and other small but necessary things to make the complete model exactly in accordance with the plans and instructions.



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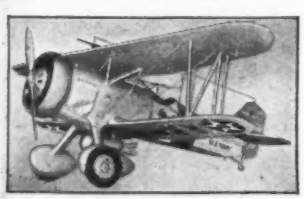

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Here's a beauty. Exact duplicate, of course, and like all IDEAL Planes, guaranteed to fly. Many details included that you cannot see. Beautiful colors. Wing span 23⅜", length 16¾", weight 3⅜ oz. **$2.00**

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You can sell finished IDEAL Planes to gas stations dealing in aviation oils; rent or sell them to department stores for special sales or sales in the sporting goods departments. You can also rent or sell them for decorative purposes to aviation associations, lodges, and club rooms. The possibilities for selling the finished planes are almost endless.

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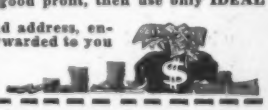

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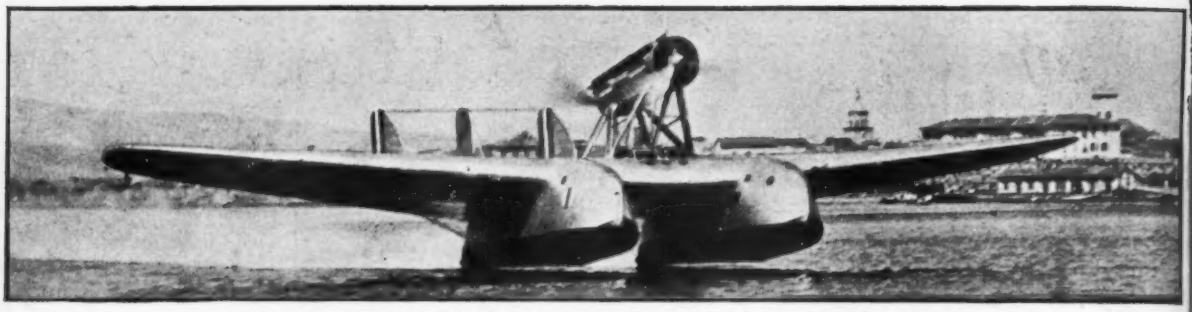


The Savoia Marchetti S-55X used as a torpedo plane and bomber, (trans-Atlantic plane)

Italy Solves Her Problem of Air Defense

Why Italy Has Developed a Powerful Naval Air Force and How It Was Accomplished Through Constant Experimentation

By FLETCHER PRATT

THE Italian fleet was at battle practice off the capes of Sicily. It was just dawn. As the early light came up out of the Orient, one could see the colossal outlines of the battleships silhouetted against it, big and black, with lean cruisers slinking along ahead of them and low-hung destroyers ploughing through the water on their flanks. Suddenly a listener at one of the audio posts on the flagship, caught a suspicious sound; he motioned to an officer. The noise continued and grew; a messenger dashed to the conning tower, and the next moment the bells were ringing for action stations all through the fleet, while the crackling wireless chattered "enemy airplanes approaching." On the decks of the big cruisers, catapults swung round and fired pursuit planes into the air, but the next minute the "enemy" was in sight; a swarm, a cloud, a tornado of at least sixty planes, high up and in perfect formation.

In the fleet the anti-aircraft guns swung into action, but far above, the leader of the air flotilla dropped a smoke-ball. Then, with the speed of darting lightning, the whole cloud of airplanes broke up into sixty separate units, shedding bombs and smoke screens to conceal the direction of their charge, then swooping in like hawks to fling torpedoes from every side into the huddled and helpless warships. "It was terrible!" said one naval officer who saw it, "they came at us from every direction at once, and we couldn't do a thing. The battleship I was on was hit by three torpedoes. The umpires ruled that most of the fleet was sunk." (Adherents of obsolete naval tactics take note: Editor).

Of course, the torpedoes, like the anti-aircraft ammunition were blanks, and the whole thing was a war game with Italian Savoia S-55s attacking Italian ships, but it gives a pretty impressive picture of what will happen to any fleet that attacks Italy in the Mediterranean. For those Italians, we rise to remark, are right out on the forefront of naval aviation. The Savoia S-55, that freak-looking seaplane with the double hulls and queerly-angled motors, is thoroughly characteristic, and one of the most efficient airplanes in the world.

But if there is anything characteristic of Mr. Mussolini's air-fighters, it is the willingness to try "nutty" ideas in aviation. They think everything is worth experimenting with. Back in the war days, they turned out those big Caproni biplanes that flew over the Alps and dumped a carload of leaflets on Vienna, warning them that it would be a carload of bombs the next time. Then came those huge crates, the Caproni "tripes" and the early high-tail Savoia seaplanes; and after the war, when most of the other countries were sitting down in order to think things over, the Italians were actually experimenting with a monstrous septuplane—seven wings, one piled above another. It failed, of course; lots of those Italian schemes do fail, but one success balances a good number of failures. The Savoia seaplane is one of the successes; so is the wonderful Macchi racer with its floats and wings all covered with radiator surfaces that Ageloo drove through the air at the incredible rate of 423¾ miles an hour, the fastest any human being has ever travelled. (See cover picture).

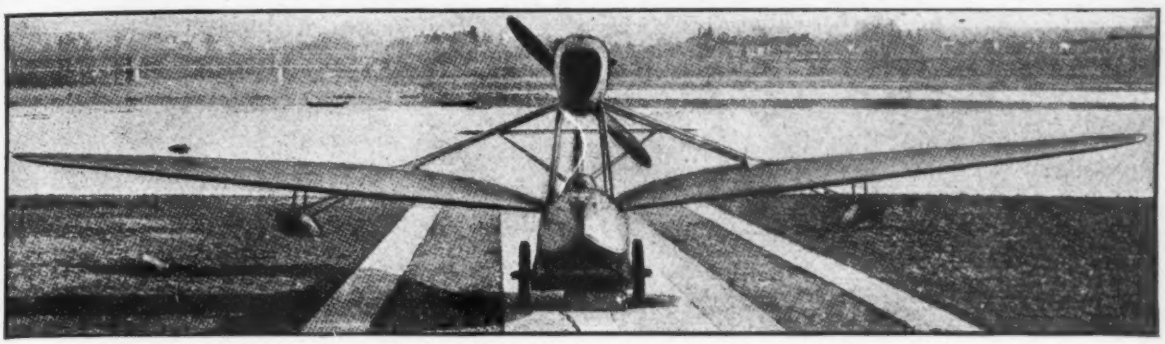
It is not mere chance, either, that both these planes, the outstanding achievements of Italian aviation in recent years, should be seaplanes. "Italy," said an aviator who was with Mussolini in his march on Rome, "is like a long dock stuck out into the Mediterranean. She is protected on the north by the Alps, which make bombing attacks by land difficult at least. But she is only two hours flying distance from the naval aviation bases of three different powers, and within five hours flying distance of her coast there are six. Not to mention fleets of other powers with their aircraft carriers. Naturally, our naval aviation must be strong."

"You see—" he went on, and waving an expansive Italian hand, explained how the Italian aviation service came to take the course of development that has made it so peculiar among the great air services of the world, for any amateur knows that Italian planes, fliers and methods are "different."

It seems the whole thing started back in 1923 when Mussolini and his famous blackshirts went into power. In that first group of blackshirts there were nine-tenths of the fliers of Italy, young, energetic, but already veterans of the World War; at their head the dynamic Italo Balbo. One of the first things the new government did was take up the whole aviation question, for these young men insisted upon it.

The new government found that Italy was following the general lines laid down by the other countries after the war—same general types of machines, same methods of training, same tactics, everything the same except for a few brilliant and abortive individual efforts, like the Caproni sep-

Here is the specially designed plane that recently captured the altitude record for Italy by climbing 15,000 meters above sea level



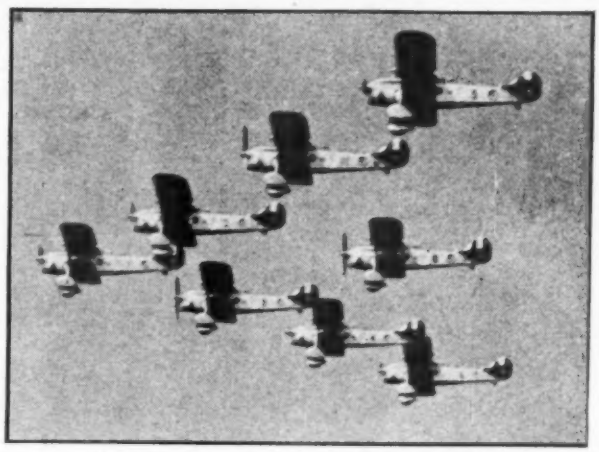
The standard Italian naval pursuit plane, Savoia Marchetti S-67. Speed, 160 m.p.h.; climb, 1000 ft. per min.

tuplane. Yet when they examined the question, they found nothing more certain than the fact that Italy occupies a special position with regard to air defense.

She does not have the vast flat plains and low frontiers of France and Germany where you can build an airport every five miles, nor the low coastal lands of Britain. Italy is "a dock stuck out into the Mediterranean" but a dock standing on one edge, being mostly mountains. The only good airport country is in the north around Milan and Parma, and that plain is all ringed round by the tallest mountains in Europe. In short, landing fields in Italy are necessarily and forever few, bad, far apart and separated by lofty and extremely high mountains where an emergency landing wouldn't do.

But on the other hand, the waters of the Mediterranean washing into the mouths of the mountain valleys, give Italy more fine, land-locked harbors than any country on the continent, and up among the mountains nestle numberless little lakes. Moreover, the Mediterranean is the calmest of the great seas of the earth; forced landings do not mean the disaster they would in the storm-swept Atlantic, but only that the seaplane has become a motorboat and must taxi for a couple of hundred miles across the surface. In short, the whole set up is ideal for seaplane operation, and as a result, the new Fascisti regime decided that Italy must take the place geography intended for her, as the world's leading seaplane country.

"You in America," said the same Italian flier quoted above, "have an immense coastline and open oceans. Therefore you must take your airplanes to the enemy on airplane carriers, and they must come to you in the same way. But we in Italy must fly our ships off the water and catch any enemy at sea with his airplane carriers or get his machines at their base."



Italy's latest pursuit ships, Fiat C.R.30s in flight

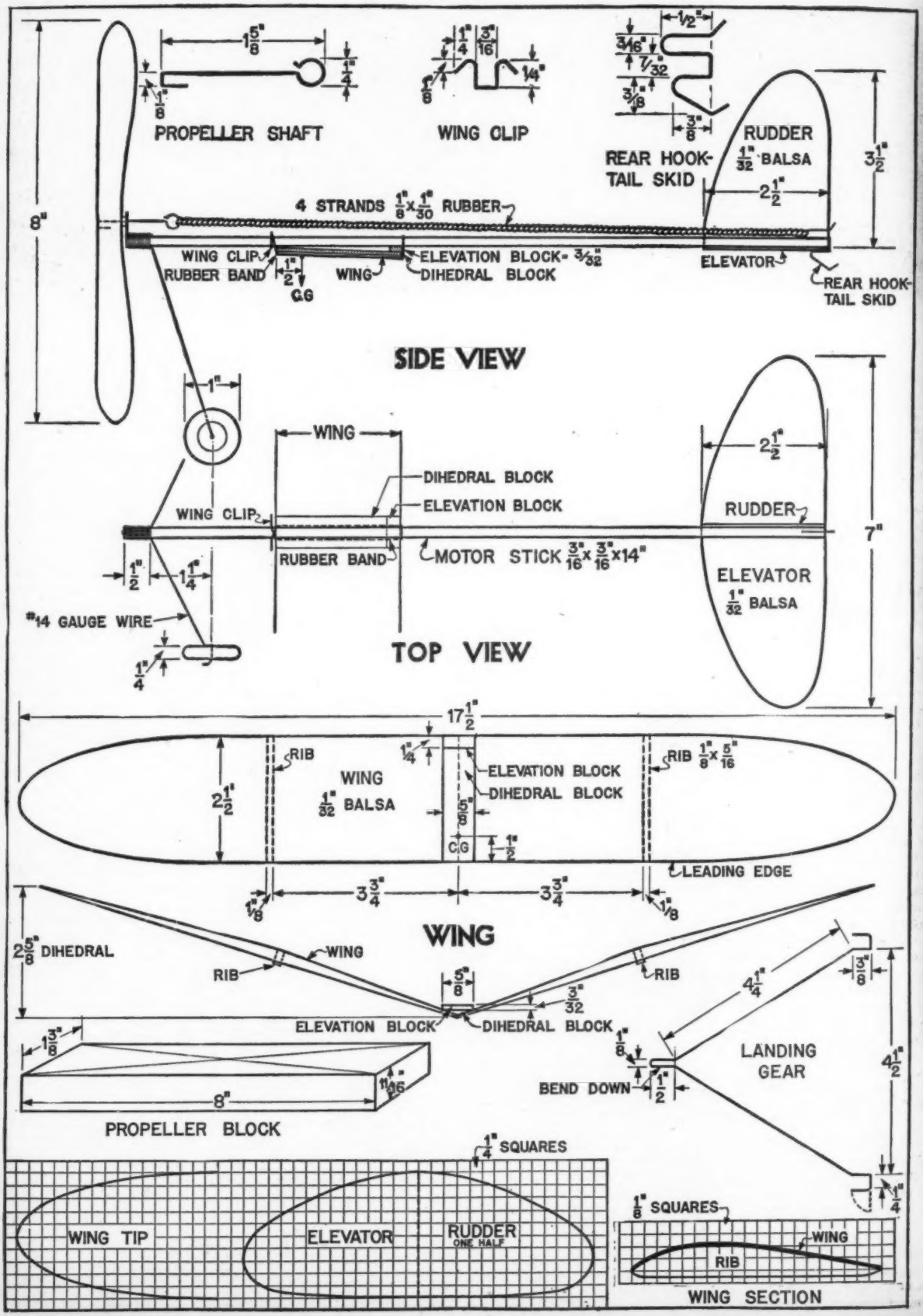
Either way you figure it, Italy's air defense is a naval aviation problem. Once you understand that, the whole story of the Italian air service becomes clear. Italy has progressed through the air in great leaps and bounds, but she has always taken off from the water for these jumps. In land-bombers, especially the heavy-load "night bombers," she is behind; the Italians couldn't use such craft if they had them, for they haven't the bases to launch them from. In pursuit ships, she is well behind both France and Britain; they aren't of much use along the coast and the Alps offers a first-class barrier to hostile land-bombers on her only land frontier. Of the huge "flying tanks," multi-motored fighters, all packed with instruments and machine-guns that are the pride of the French flying serivce, she has none at all. All her strength is concentrated around the fast seaplane scouts and the big seaplane bombers of the trans-Atlantic Savoia type.

These Savoias, by the way, are one more Italian invention that worked. One of the first things the young Fascisti did when they took control was to restore the Italian policy of trying any thing once and everything at least once. Probably more freak ships were built in Italy between 1923 and 1933 than in all the rest of the world put together.

There has been that singular Stipa "barrel-plane"—just a Venturi tube with two little stubby wings sticking out from it and the prop in the center of the tube. (This idea has not been dropped; the Caproni firm is even now building a three-motored barrel-plane). There was the gigantic Caproni 90, that crazy-looking biplane bomber, with the lower wing nearly twice the span of the upper and provided with a sharp dihedral. There was the tremendous Pegna seaplane which had *no floats at all*, only a pair of two-foot wide metal plates where the floats should have been, and rested on the water, floating on its air tight wings, its propeller half submerged. (This machine, one of the most original of all, started through the revolution of a water-propeller at the rear. The metal plate "floats" acted on the water as wings acted in the air, causing it to rise as it attained speed, till the air-prop was out of the drink; then the pilot

(Continued on page 44)

A few planes of the Italian air force assembled for maneuvers. In the foreground, are Fiat Scouts, C.R.20 bis'; center, Caproni 90s (bombers); rear, Breda 16s (fighters)


PROPELLER SHAFT
WING CLIP
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RUDDER
1/32 BALSA
4 STRANDS 1/8 x 1/30 RUBBER
WING CLIP
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C.G
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WING
2 5/8" DIHEDRAL
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ELEVATION BLOCK
DIHEDRAL BLOCK
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BEND DOWN
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1/4" SQUARES
WING TIP
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RUDDER ONE HALF
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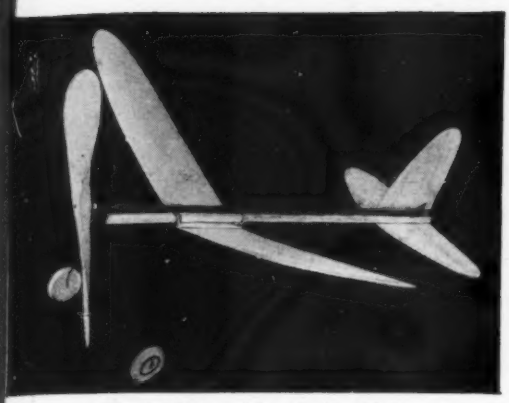
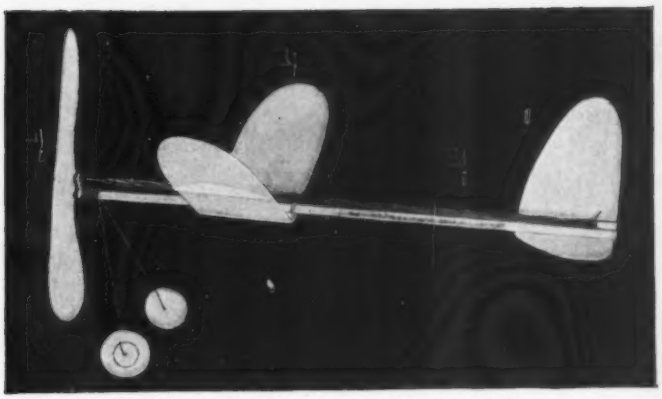


The finished model ready for a flight



The design of this model is perfect for stability

Fundamentals of Model Airplane Building

A Complete Course for Beginners Who Wish to Become Expert. How to Build a Fine Flying Practice Model—Part No. 5

By EDWIN T. HAMILTON

Models Designed By Charles Hampson Grant

WE PRESENT here our fifth article on model airplane construction. This little model typifies the principles of design which your editor, Charles H. Grant, has been advocating in his popular series of articles "The Aerodynamic Design of the Model Plane." Freak tests with this model have proved beyond doubt the soundness of Mr. Grant's designing principles.

Possibly the most interesting test made with this model, and by far the most important one to the average model airplane builder, was the poor launching test. The model was released with its wings at a ninety-degree angle to the horizontal. While this would spell ruin to the flight of the majority of models, it immediately righted itself and flew perfectly upon being launched.

Many other severe tests were given it, both in the method of launching and the weather in which it was flown, but in all cases perfect flights resulted. Its performance and stability are exceptional. Out of some ten flights it averaged, when hand wound, 30 seconds duration covering an average distance of 450 feet. For the beginner who has not yet developed the technique of model plane flying, it will prove especially adaptable.

Here is a model guaranteed to be a "sure fire" flyer under all conditions. It will prove a splendid practice model for every beginner, whether he is building his first model, or for the expert wishing to test the aerodynamic designing principles upon which it has been created.

Motor Stick

The motor stick of this model consists of a single stick of balsa wood. When sandpapered smooth, it must measure 3/16″ thick, 3/16″ wide and 14″ long, as shown in the plans under "Top View." Do this sanding with the aid of a block, as shown in the May issue under Fig. 5 on Page 9.

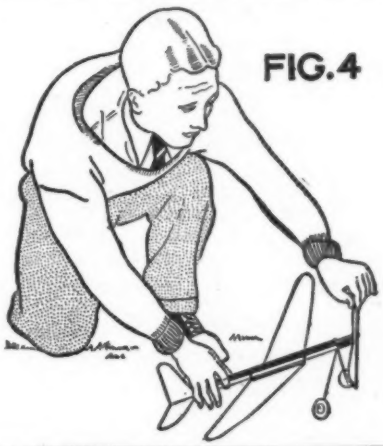


FIG. 4

Elevator

The elevator requires a piece of sheet balsa measuring 1/32″ thick, 2¾″ wide and 7¼″ long. A graph plan of its form is shown at the bottom of the plan under "Elevator." Make a copy of this on paper ruled with ¼″ squares. (See the June issue, Page 8 for instructions in this work).

The elevator is then cut to its proper form. Make all cuts just outside the lines so that its edges may be sandpapered smooth down to the lines. When completed, it should be 1/32″ thick, 2½″ wide and 7″ long, as shown in the top view of the plans under "Elevator."

Rudder

As shown in the graph plan, the rudder is the exact size and shape of one-half of the elevator. Divide the pattern of the elevator in half, as shown by the dotted line in the graph, trace it on 1/32″ sheet balsa and cut out. Sandpaper its edges smooth and down to exact size. Test for exact form by placing it on one-half of the elevator and seeing that it is a perfect duplicate of the elevator half.

Wing

Obtain a piece of sheet balsa measuring at least 1/32″ thick, 2⅝″ wide and 17¾″ long. Study the top view of the wing in the plans under "Wing." This shows the wing as it looks after being bent around its two ribs, as shown under "Wing Section." The width of

JUNIOR MODEL AIRPLANE BUILDERS CONTEST

Here is a chance to use your craftsmanship to advantage and win one of the five monthly awards. This is all you have to do to enter the contest:

Build the model described in each one of these monthly articles. Photograph it or have it photographed and send the photographic prints to the Editor, **Universal Model Airplane News**, with a written description of what you thought the most difficult operation in the building of the model and how you overcame it.

This contest will run for five months. It will begin with the model appearing in the May issue and will end with the model appearing in the September issue of this magazine.

The five best sets of photographs and disussion of each model will be chosen by the judges from those submitted and an award of five dollars will be paid to each one of the contestants for each winning entry that they submit.

The winning entries will be selected on the following basis:

Accuracy and neatness of the model as judged from the photograph, the quality of the photograph itself, and the comprehensiveness of the discussion and the neatness of presentation of the entry.

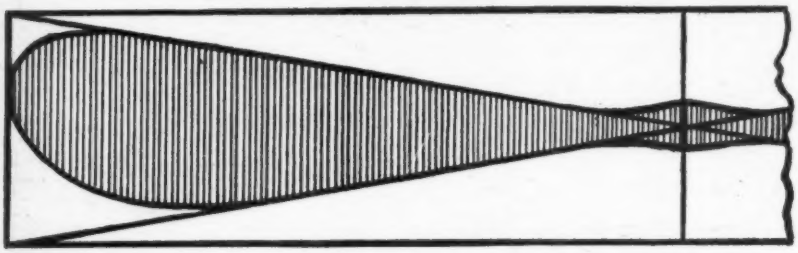
Those who will act as judges are Mr. George C. Johnson, publisher; Mr. Edwin T. Hamilton, author; and Mr. Charles H. Grant, editor.

Plans and instructions for building four models have been published. The first one was in our May issue. The model in this issue is the fifth one.

Get busy on the model now, for all entries for model No. 4 must reach this office before midnight, Friday, August 31st. Entries for this model, the fifth one, must be in this office by midnight, Friday, September 14th.

No entrant will be eligible for an award unless he truthfully states that he has built the model himself and gives his correct age and address. Give this information at the end of your discussion and have your parent or guardian sign it as a witness.

This may be the start of your career in aviation. Get busy now. Send all entries to Charles H. Grant, editor, **Universal Model Airplane News**, 551 Fifth Avenue, New York City.



PROPELLER PATTERN

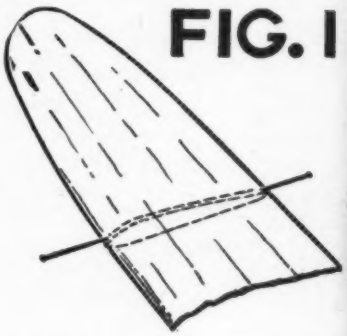


FIG. 1

the wing after bending is 2½", but the original width must be 1/16" wider to allow for its bend. In this manner, the wing must be cut and its edge sandpapered down to 2-9/16" wide.

The tips of the wing should be cut from a pattern made from the graph plan under "Wing Tip." Cut and sandpaper the wing to exact width, trace and cut one tip and finish this by sandpapering down to the pattern line. The length of the wing is then measured exactly 17½", the second tip braced, cut out and sanded smooth.

Locate the exact center of the wing, draw a line from side-to-side at right angles to the sides, and then crease along this line on the upper surface of the wing. This permits it to be bent for the required dihedral without severing the halves.

Cut a dihedral block ⅛" thick, ⅝" wide and 2½" long. This is shown in the plans under "Wing," "Top View" and "Side View." Shape the block in the form of a triangle, as shown in the front, or edge view of the wing, so that it can be fitted and cemented directly over the center creased line of the wing.

The wing is now given its required 2⅝" dihedral at each wing tip. Place one side of the wing flat on the table and carefully raise its other half until the tip is 5¼" above the table surface. When in this position, test to see that the dihedral block fits the angle of the two halves formed at their center. Hold in position, coat with cement and press the dihedral block into the center groove formed by the two wing halves. Small model pins may be driven through the underside of the wing into the block until the cement has dried. They are then removed.

After the cement has thoroughly hardened, the wing ribs are cut and cemented into place. These are carved from ⅛" thick, 5/16" wide or high, and 2½" long balsa wood pieces. Note their exact form in the graph plan under "Wing Section." Two of these will be needed. Carve until exactly like the full-size pattern and finish smooth with sandpaper. They are now cemented in place on the underside of the wing. Locate their position from the plan under "Wing."

Each of these two ribs are attached 3¾" from the center line of the wing. Coat the top of one with cement, press it into place at the leading edge and force a model pin into it through the wing at the angle shown in Fig. 1. The wing is then carefully bent around the top curve of the rib and its trailing half held with a pin as shown. The second half of the wing is bent and the rib attached in the same manner. Note that these ribs extend slightly below the leading and trailing edges of the bent wing. Complete the wing by cutting a small elevation block. This is shown at the trailing edge of the wing in the plans under "Side View." It must be cut 3/32" thick ¼" wide and ⅝" long. Cut this to size and sand all sides smooth. This elevation block is now cemented on top of the dihedral block at the trailing edge of the wing, as shown in the plans under "Side View."

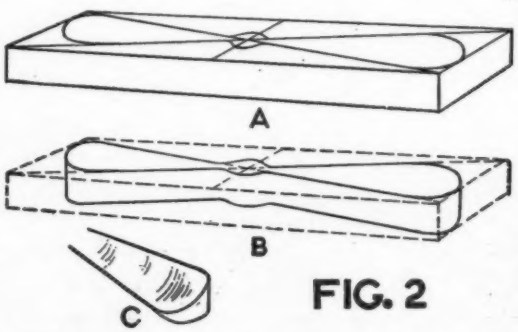


FIG. 2

Propeller

The propeller is carved from a blank cut from a 11/16" thick, 1⅜" wide and 8" long balsa propeller block. The propeller given last month was carved direct from the block but this one has its blank cut out first and the carving done from this blank.

The form shown for this model is known as a "U. S. Navy" type propeller. It is the most popular type of propeller for such models. Study the full-size pattern of the propeller. Draw two diagonal lines across your block and then draw within these lines the form of the blades, as shown. The block is now ready to be cut out. The steps of this work are shown in Fig. 2. Your block will look like the one shown at "A" when the blade design has been drawn on it.

This block is then cut along the blade outlines, which makes the block into what is known as a "blank." At each end, the blank is marked with a curve to indicate the cuts to be made when carving. The blank cut out is shown at "B," while "C" shows the end marked. From this point on, the propeller is carved exactly as was the one described in the August article. Finish by sandpapering both blades perfectly smooth and cutting the hub down to ¼" thick.

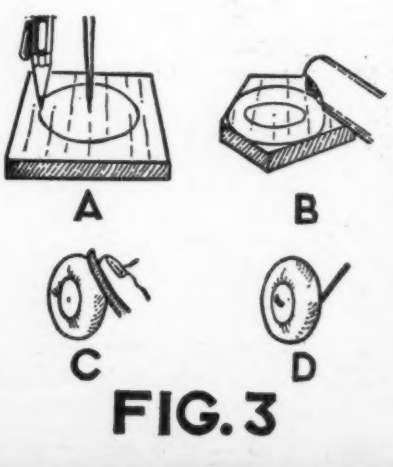


FIG. 3

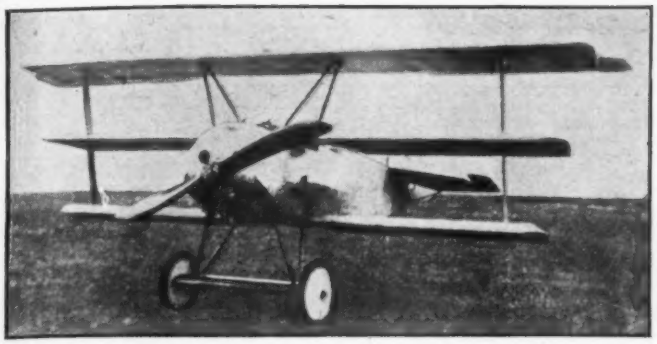
Metal Fittings

All metal fittings with the exception of the propeller bearing, are bent from No. 14 piano wire, as discussed in the August issue. We require four such fittings. The usual combination rear-hook and tail-skid is bent from one length, as shown at the top of the plans. One wing clip is required, as well as a propeller shaft. As these are practically duplicates of those given last month, no further instruction on bending them to form will be given. The landing gear is also similar to the one shown last month. It is bent from a single length of wire, as shown in the plans under "Landing Gear." Complete the list of necessary metal parts by purchasing a light propeller bearing.

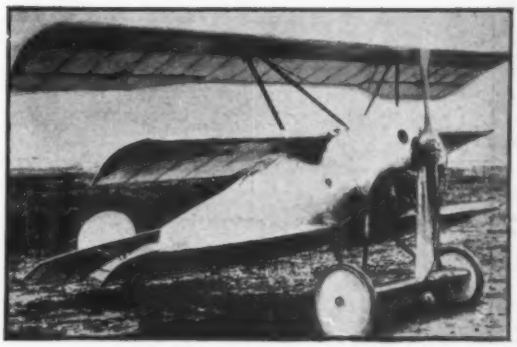
Wheels

The two wheels are of the solid balsa, carved type. Two pieces of balsa measuring ¼" thick and 1" square will be needed for them. Set a compass at ½" and scribe a 1" diameter circle, as shown in Fig. 3, "A." This is then cut out with the cutter, as shown at "B." The circle is sandpapered into the form of a wheel with No.

(Continued on page 44)



The first accepted Fokker Dr. 1. Struts made it acceptable



Fokker's first triplane built in late 1916

The Development of The Fokker Fighters

How the Rejection by the Germans of Two Well Designed Planes Led to the Advent of the Fokker Triplane and Why It Was So Successful

By ROBERT C. HARE

Part No. 10

DURING the months following the production of the Fokker D.IV, Fokker again found his quota of Mercedes Six engines curtailed at headquarters' orders. In addition, his plants at Schwerin were engaged in routine production of great batches of A.E.G. training airplanes. In order to divert his attention to new designs, Anthony Fokker decided to hire a production manager to whom was entrusted the job of organizing the plant on a profitable basis.

Relieved of business worries, Fokker once more took to the drawing board and designed a radically new type of pursuit ship. In appearance it put to shame many of the modern "streamlined" planes and like many other Fokker wartime models, was years advanced in design.

When completed the new Fokker was classed as the V.1. It was a full cantilever winged biplane of small dimensions, and impressive because of the lack of interplane struts or bracing wires. Both wings were built of wood including the veneer covering and were heavily staggered. The lower wing was of lesser chord and span and was tapered from the leading edge only, leaving the trailing edge straight.

Striking also was the fuselage of the V.1. Built of steel tubing, the body was a complicated affair made up of a welded steel frame to which was attached curved formers. Over these formers a series of stringers was affixed to carry out the roundness of the motor, the full length of the body which tapered off to a point at the rear end.

In harmony with the other components, the tail assembly was without external bracing. A root to which the rudder was pivoted was built integrally with the fuselage similar to the present day Northrop rudders. The entire rudder was movable and since the pivot tube was located several inches to the rear of the landing edge, a considerable balancing force was imparted in flight.

An Oberursel rotary motor provided 115 horsepower for the V.1. A large spinner was fitted over the propeller hub in the manner of the Fokker D.V. The famous Fokker axle wing came into being with this model and aided greatly in the final performance of the ship.

Rightfully proud of such a fine airplane, Fokker lost no time in having an official demonstration of his new beauty.

The Fokker V.II fitted with a water-cooled engine. Without struts it was very fast

A Fokker Dr. 1 off on patrol, climbing steeply from the hangars in background

However, after putting the V.1 through every maneuver known to combat flying time and time again, the conservative German officials said "No," and the V.1 was not accepted.

In performance, however, the V.1 probably could have equalled if not surpassed any airplane built during the War. And although the V.1 was in a way, a failure, it convinced Fokker of the practicability of cantilever wing construction as taught by Professor Junkers, and can be called the force responsible for building the Fokker Dr. I.

By way of variation, a modified V.1 Fokker was next constructed and identified as the V.II. Construction for this model was identical to the former type with the exception of the rudder and the motor.

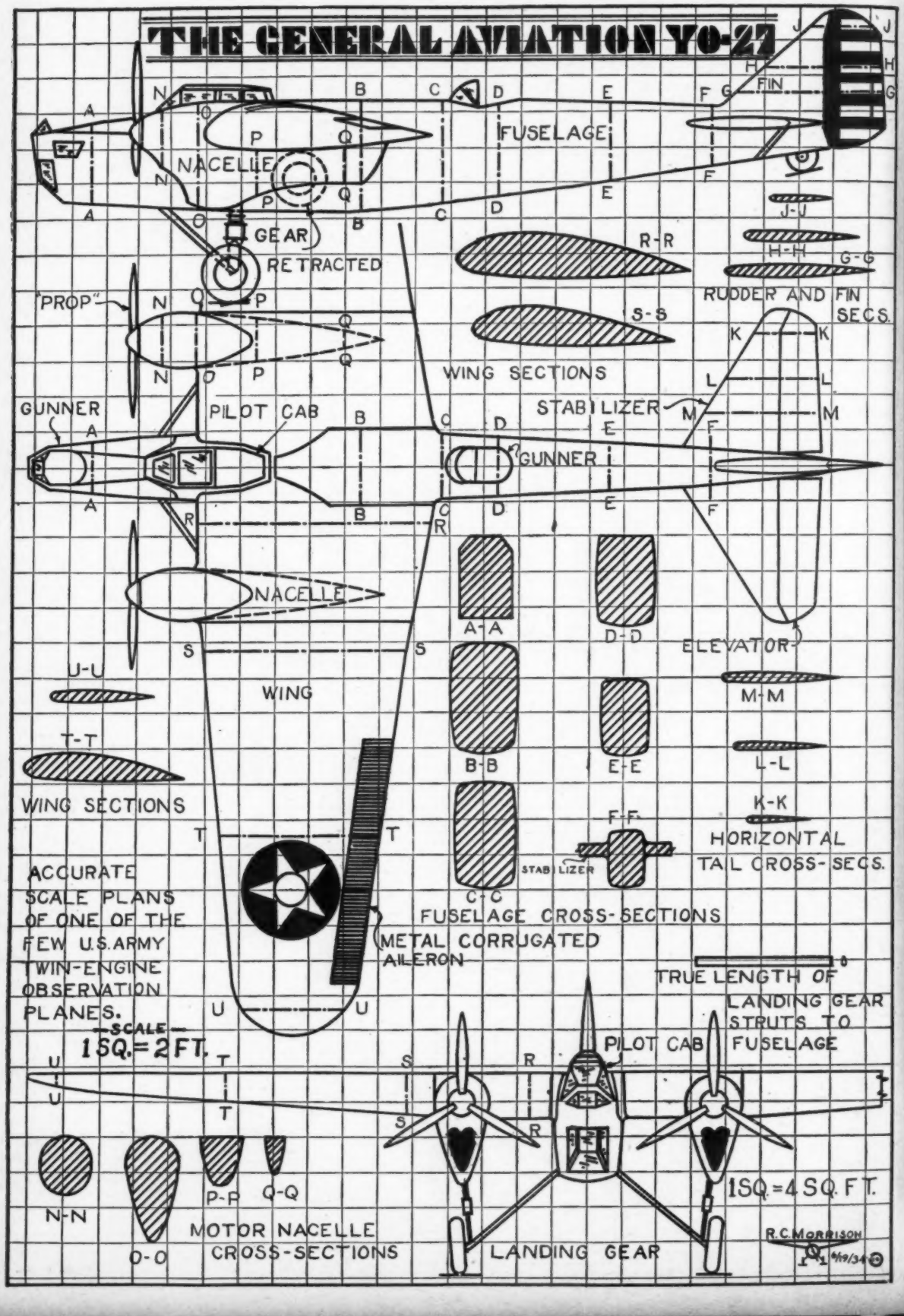
The large round body made necessary by the rotary motor of the V.1 was not altered in the V.II. By lengthening the fuselage slightly to take the water-cooled motor, an almost perfect streamlined shape was obtained. The front end was finished off in a large spinner.

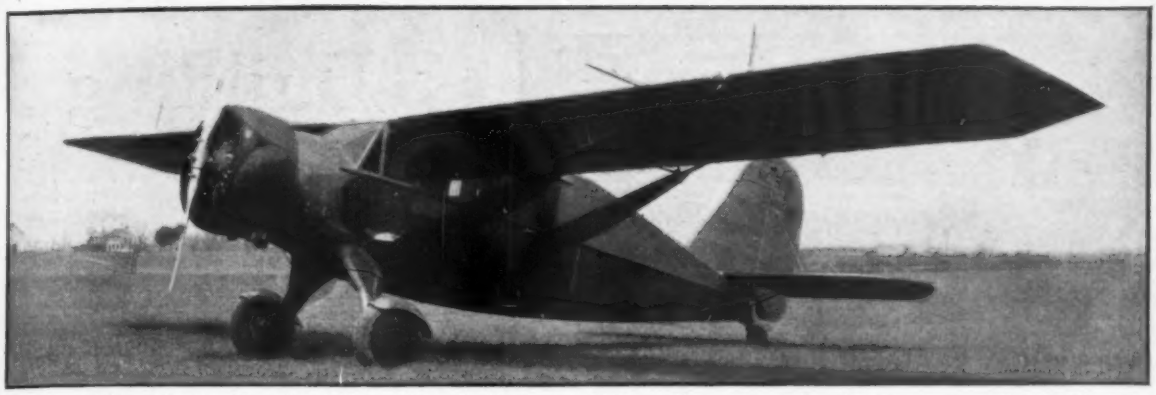
A large radiator was located in the center portion of the upper wing, strangely enough, out of the slipstream of the propeller. Exhaust fumes were led forward and dispersed through a solitary pipe just behind the spinner. The landing gear remained the same with the wing axle and steel construction.

While maintaining the same shape, the wings of the V.II were set farther apart. In the new ship, the upper wing was raised off the fuselage a considerable distance; whereas the V.1 was given a racy appearance by the upper wing which nearly rested on the fuselage.

Instead of a straight tapered rudder, the V.II carried a well curved rudder and fin similar in shape to the contemporary Albatros rudders.

Performance data on the V.II could not be located, but because of the longer fuselage and heavier weight of the motor, the speed might have been increased over that of the V.1, but at the expense of maneuverability. (*Cont. on page 40*)


THE GENERAL AVIATION YO-27
FUSELAGE
NACELLE
GEAR RETRACTED
"PROP"
GUNNER
PILOT CAB
WING
STABILIZER
FIN
RUDDER AND FIN SECS.
WING SECTIONS
ELEVATOR
HORIZONTAL TAIL CROSS-SECS.
FUSELAGE CROSS-SECTIONS
METAL CORRUGATED AILERON
ACCURATE SCALE PLANS OF ONE OF THE FEW U.S. ARMY TWIN-ENGINE OBSERVATION PLANES.
SCALE 1SQ.=2FT.
TRUE LENGTH OF LANDING GEAR STRUTS TO FUSELAGE
1SQ.=4 SQ. FT.
MOTOR NACELLE CROSS-SECTIONS
LANDING GEAR
R.C. MORRISON
9/9/34



The new Bellanca Senior Skyrocket with cantilever landing gear which provides every comfort for its passengers. Speed 185 m.p.h.

On the Frontiers of Aviation

Latest News and Data of Airplanes That Are Making Aviation History and How to Build a Scale Model of the G. A. YO-27

By ROBERT C. MORRISON

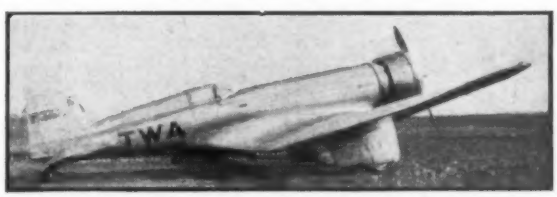
THE year 1934 promises to be one of the greatest years of air racing, the most outstanding race of which will be the MacRobertson trophy race, mentioned in earlier articles of this magazine. One section of the race will be a handicap race of standard make planes from London, England, to Melbourne, Australia, with twenty-three required checking points along the route. The other section will be a free-for-all for approved type high-speed planes with required stops at only Bagdad, Allahabad, Singapore, Darwin, Charlevill, and Melbourne. The number of racing planes expressly built for the race will unquestionably be very great.

One of the most interesting is that being built for Miss Jacqueline Cochran by Miller & De Lackner, (formerly associated with the late Z. D. Granville). The ship will cruise at 250 m.p.h. and will have a range of 3000 miles. A 700 h.p. Curtiss Conqueror engine will power the plane! It is a three-place, low-wing cabin monoplane with wing flaps.

Another new racing plane is the Bellanca low-wing 28-70 being constructed for Col. James C. Fitzmaurice. The cruising speed is expected to be between 230 and 260 m.p.h., the power being supplied by a Wright double-row engine.

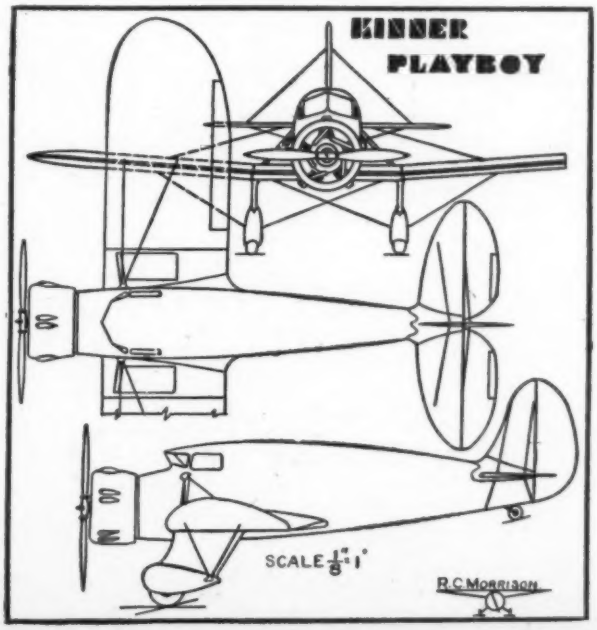
Last month Bellanca received an export order for $300,000.00 for a fleet of their new transport planes.

Laura Ingalls has bought a new Lockheed Orion as have many other contestants. The Lockheed company has put out a new Orion radically different from former ones, more closely resembling the Lockheed Altairs and Northrop Gammas, and it may be this type of Orion that has been ordered by the speed fliers for the MacRobertson race.



The new Northrop Gamma (Courtesy Gordon Light)

The closing date for the entrants in the two races was June 1, 1934. As we go to press official word has just been received from abroad as to the names of the contestants which will be found at the end of the article.



Mr. and Mr. Thaden's ship is one of the latest Beechcrafts to be designed. The first of the 230 m.p.h. planes was completed last month. It is powered by a 650 Wright Cyclone.

Jack Wright intends to fly his new Monocoupe in the 13,000 mile race. He is at present performing stunts with the little "clipped-wing" ship at Floyd Bennett Field, Brooklyn, N. Y., with American Air Aces, who put on an excellent show for the public every week-end.

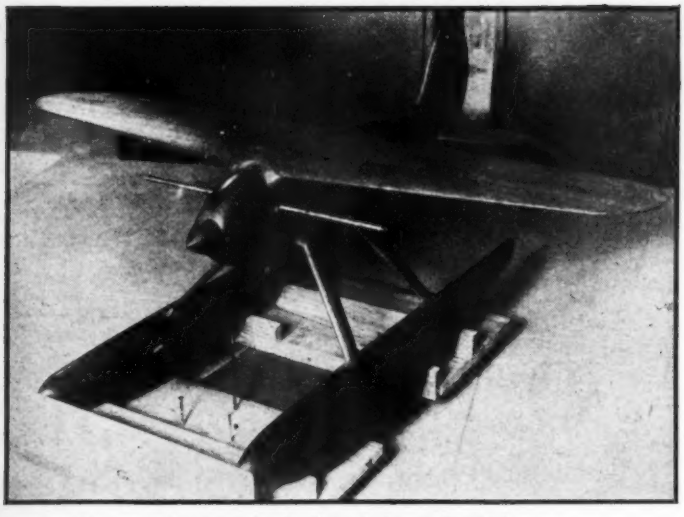
Another important race that took place last month, was the French Coupe Deutsch de la Meurthe. A specially built Caudron 450 won the race at 241.62 m.p.h. This is exceedingly good for a 315 h.p. plane. American Zapp wing flaps were used on the French racer. There were also other similar Caudrons and one Comper Streak in the contest

The King's Cup Race (England) will also encourage the building of new high speed ships. As we go to press, thirty-eight planes have been entered so far in the contest, which took place July 13-14. Some of the new planes designed for the two-day grind are the Airspeed Courier; Comper Kite, Mouse, and Streak; Klemm Swallow, Coupe Moth, Hendy Heck (many American feautres), Miles Hawk, Percival Gull, and the Percival Mew Gull, all English planes.

The National Air Races will be held at Cleveland this year and we may see some of the Mac Robertson contestants compete there and probably some other new racing planes.

The successful operations of the U. S. Coast Guard Air Service has more than proven its

(Continued on page 46)



An example of a fine wind tunnel model

Building Models for the "Tunnel"

Complete Details of How You Can Build Accurate Wind Tunnel Models

By ALEXANDER KLEMIN
Director, Daniel Guggenheim School of Aeronautics, New York University

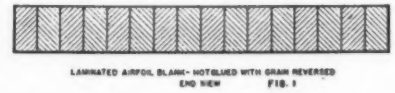
Part No. 2

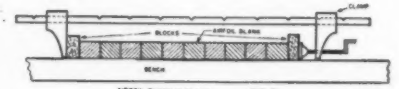
Part 1 of this article described the wind tunnel and some of its uses. Part 2 deals with the construction of the wind tunnel model in some detail. Can the experienced builder of flying models construct a wind tunnel model so that it will meet the critical inspection of the aerodynamicist, on whose judgment and tests the airplane designer has to depend so much?

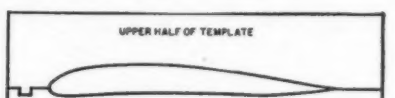
THE most difficult part of the wind tunnel model is of course the airfoil because its contour has to be accurate within ± 3/1000ths of an inch. A slight error, particularly in the region of the sensitive leading edge, can change the characteristics of the airfoil entirely.

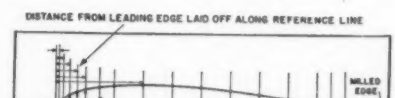
Should the airfoil be built of metal or wood? Metal makes for greater accuracy and for permanence of form. But a metal airfoil requires much more time and skill. On the whole, wood is quite satisfactory (except for very thin airfoils), if certain precautions and rules are observed.

The profile should be made of well seasoned, clear, hard and close grained wood, preferably mahogany, quarter sawed and laminated with grain reversed as shown in Fig. 1. Lamination is essential if warping is to be prevented, and a warped wing is useless. For a 9 foot tunnel, a fair size for the airfoil is 48 inch span and 8 inch chord, and the laminations should then be ½ inch wide, or some 16 strips in all, cut from a board about 1 inch thick. The laminations are placed in an oven, heated to about 100 degrees Centigrade, spread with hot glue and clamped together with heavy blocks on each side so that the total length will be under even pressure. Such a clamp is fairly easy to improvise and need not alarm the reader. The airfoil blank (Fig. 2) is left in the clamps for a day or two. As the hardened glue, adhering to the faces of the blank, quickly dulls edge tools, it should be removed as far as possible with a glue scraper. The faces of the blank are now planed down flat and parallel, care being taken to remove the same amount of material on both faces, otherwise the material will curl towards the face from which the larger amount of stock is removed. To cut laminations, hot glue, clamp, wait two days and then see the blank curl, is a supreme irritation!







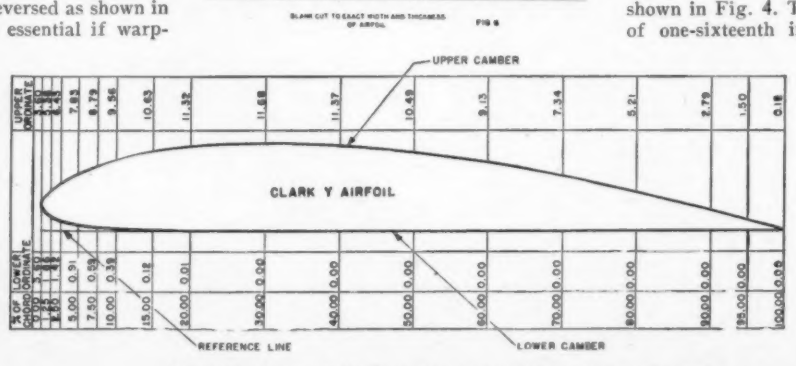


Drawing of the Section

Now a very accurate drawing of the section of the airfoil, drawn full scale, with all dimensions marked along the chord and perpendicular to the chord, must be made. Such a drawing for the Clark Y, a well known and excellent airfoil, is shown in Fig. 3.

Making the Airfoil Templates

In making really good airfoils, it is always best to make templates such as shown in Fig. 4. The templates are made of one-sixteenth inch tool steel worked by hand to within 1/1000th of an inch of the given contour. The template is always started with a metal plate straight along all edges. The plate is first finely cut into an upper or male part, and a lower or female part, fitted together as shown in the sketch. With the help of the accurately dimensioned drawing of Fig. 3, a sharp marking



ALL DIMENSIONS ARE GIVEN IN PERCENT OF CHORD. FOR A PARTICULAR AIRFOIL ALL DIMENSIONS SHOULD BE GIVEN IN INCHES THE DIMENSION IN INCHES IS EQUAL TO $\frac{\text{PERCENT}}{100} \times \text{CHORD}$

FIG. 3

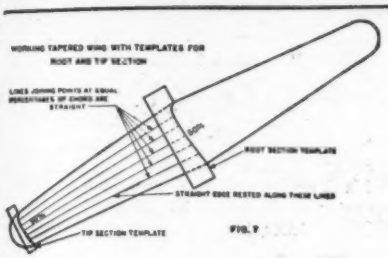


FIG. 7

tool and a micrometer gauge, the upper surface of the wing is marked out on the template as shown in Fig. 5 at a number of stations set off from the leading edge with the top line of the female template as a base. The upper surface is then cut and filed down to shape by hand. Then the process is repeated for the lower surface, with micrometer measurements taken from the upper surface of the female template

Finishing the Wing

The laminated block is now saw cut and planed to the exact maximum width and thickness as shown in Fig. 6. Surplus wood is then sawed off and the airfoil is planed down to a very near fit to the contour. In this process, it is a great help to have a drawing glued on to one end of the blank. After a near fit has been obtained with saw and plane, the airfoil is finished to fit the template with sandpaper—a slow but accurate undertaking.

Thin Rear Edge Wings

Airfoils coming to a knife edge may have to be provided with a trailing edge made of brass. It is irritating and time wasting and temper destroying to build a beautiful airfoil and see the thin trailing edge nicked or even broken when the wing is being mounted in the tunnel.

Tapered Wings

The easiest tapered wing to make is one which tapers linearly, so that a straight edge can be laid on the surface from section to section at equal percentages of the chord, as illustrated in Fig. 7. For such a tapered wing, it is only necessary to make two templates, one at the root and one at the tip. After the laminated block has been sawed and planed to the approximate dimensions required, the root and tip are finished off as before with templates and sandpaper, and the straight edge is used to work down the sections between root and tip.

Where the wing does not taper linearly, many more templates have to be made and considerable skill has to be exercised in working down between sections for which templates are available.

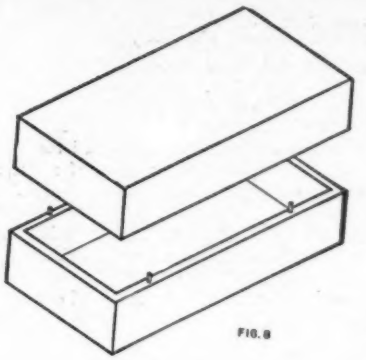


FIG. 8

FIG. 10 ELEVATORS HELD IN PLACE BY BRASS PINS

Making Airfoils of Plaster

Where an airfoil is to be part of a complete airplane or is to be kept for permanent laboratory use, it can only be made of wood, steel, brass or aluminum. But sometimes when modifications of airfoils are being rapidly studied and a permanent model is not needed, wings can be made quite satisfactorily out of plaster in the following manner.

Two channel-shaped metal flasks with upper edges machined, are fitted together with dowel pins, as shown in Fig. 8. Two accurate, positive templates are made to the sectional form of the wing, with lugs at the end to fit on the flask and guides to keep it square (see Fig. 9). The flasks are now filled with well-calcined plaster of Paris that has been mixed into a thick paste. The templates are used as scrapers to form the wet plaster to shape. After the

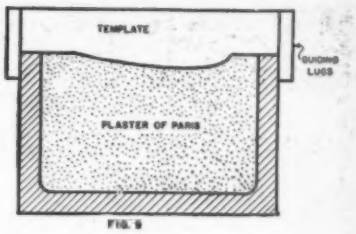


FIG. 9

plaster has set, the templates can be used to finish the moulds down to the correct size. A very good finish can be obtained in this way, but the final finish should not be given until the plaster is dry, or the shrinkage may distort the models.

The surfaces are now painted with linseed oil and the flask is clamped together. One end is plugged and the mould may now be filled with a thin mixture of plaster or by some melted wax which possesses considerable hardness and strength when cool. After the mixture has set, the wing is removed and the upper end trimmed off to the proper length. If carefully made, the model has a good finish and is accurate—at least initially. But since it is not very permanent, it should be tested soon after completion.

A Simple Way of Attaching Movable Control Surfaces

When an airplane is being tested in the tunnel, the power of the control surfaces must be investigated so that elevators, rudder and ailerons are made movable.

The simplest way to secure movable surfaces is illustrated in Fig. 10. The surfaces are cut with a very fine jeweler's saw, the inside edges are beveled and several pieces of soft brass wires are inserted as dowel pins. With soft brass, the movable surface can be readily turned to any desired position. The size of the wires and their spacing depend on the size of the model and the wind speed at which it is tested. The disadvantages of this method are that the gap between fixed and movable surface may be too large and that the soft wires may not hold the movable surface firmly enough.

Aileron Hinge

A more complicated, but probably more effective method of constructing a hinge such as an aileron hinge is shown in Fig. 11. The aileron is sawed out with a fine saw and a thin brass plate is embedded in the upper surface of the wing with two flush wood screws. The extension of the thin plate constitutes the aileron hinge,

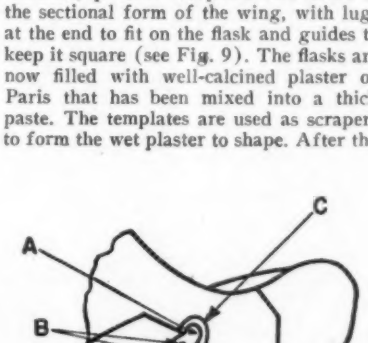


FIG. 12

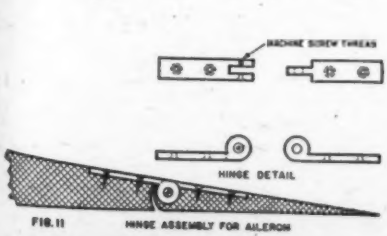
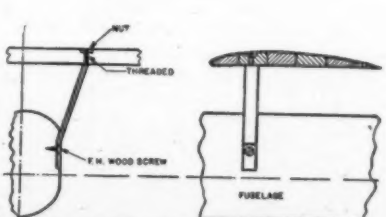
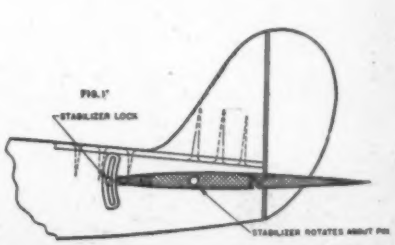


FIG. 11 HINGE ASSEMBLY FOR AILERON



ATTACHMENT OF STRUTS TO WING AND FUSELAGE
FIG. 14



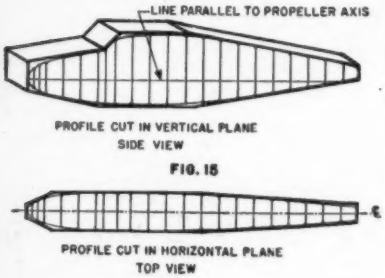


FIG. 15

while a plate and a hinge are similarly fastened to the aileron. The wing hinge is screw-threaded on one side and a screw can be tightened into the hinge far enough to hold the surface securely. Similar methods can be employed for the rudder and elevator hinges.

Stabilizer Adjustment and Tail Surface Assembly

In general the horizontal tail surfaces and the vertical tail surfaces can be constructed very much like the airfoil itself, except that they are symmetrically double cambered and therefore easier to build. Also they need not be quite so accurate as the airfoil itself. These surfaces are frequently quite thin on a model and in such a case it is advisable to make them of metal.

Since a modern airplane, particularly a transport airplane carrying passengers, has to take care of varying loads and hence of varying center of gravity positions, it must embody an adjustable stabilizer, with considerable angular movement both up and down. A very simple plan for stabilizer adjustment is shown in Fig. 12. The two halves of the stabilizer are mortised out and fitted into the sides of the brass cylinder (a) with brass pins (b), all filed flush with the stabilizer surface. The brass cylinder is a friction fit in the split ring (c) screwed into the wood of the body.

A more elaborate method of stabilizer adjustment is shown in Fig. 13, with a very positive method of locking the stabilizer into position during any run. This Fig. 13 also illustrates a typical tail surface assembly; the tail surface assembly may be built a little more simply, but this drawing indicates a method which is quite satisfactory.

Struts and Their Attachment

Streamline struts may be made of either brass or steel and are provided with round threaded portions at either end so that the wings may be properly aligned after assembling (see Fig. 14). In assembling paper shims may be used under strut shoulders to facilitate the wing alignment. Struts with threaded portions also facilitate quick assembly and disassembly. A typical method of attaching struts to wings and fuselages is illustrated in Fig. 14. It will be noted that the struts are bent sharply as they meet the body so that the face of the strut is parallel with the body and is mortised in flush with the surface and held by small wood screws.

Making the Body or Hull

The construction of bodies and hulls requires less accuracy than the wings. A tolerance of 2/100ths of an inch is generally considered quite sufficient. The model maker who has completed the wing will turn with almost a sigh of relief to the making of the simple body.

For the body, mahogany may be even replaced by white pine or bay mahogany, woods that are light, easy to work and not liable to warp.

Small bodies may be made of one piece sawed out to the correct profile in two planes, as shown in Fig. 15. The edges cut off in the first sawing are lightly bradded on to the body in order to steady it when sawing the second side. The four sides are then planed down accurately to size, and by the aid of templates, the corners are worked off with plane or spokeshave. The surface is then scraped and finished with shellac rubbed down with pumice and oil.

In an open cockpit plane, the cockpits should be cut to at least half the depth of the body, but no details inside such as the seat should be included. Windshields, however, should be put in place and knobs representing the men's heads, fastened to the rear of the cockpit.

Large bodies are sometimes made hollow, so that the model should not become too heavy, which is detrimental to accurate work with the tunnel balance. This is best accomplished by cutting out a series of lifts from thin ¼ inch stock. These are sawed out and planed accurately to outline and the whole set glued together with hot glue, being held in alignment by dowel pins on the base plate, as shown in Fig. 16. When the glue is hard the pins can be cut off flush and the outside surface of the model planed down smoothly to the contour lines of the lifts. This method gives a light and accurate model requiring few templates for finishing. A line

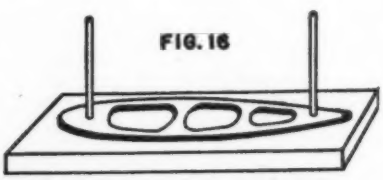
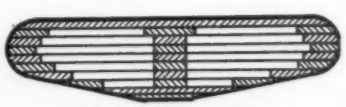


FIG. 16

METHOD OF MAKING HOLLOW MODELS



LARGE HOLLOW WHEEL
CROSS SECTION SHOWING LAMINATIONS
FIG. 17

should always be marked on the side of the body parallel with the propeller axis, in order to aid in lining up the model.

Landing Gear Wheels

The wheels when small may be turned out of solid maple. If the wheel is to be tested alone, however, and is therefore large, it should be glued up of pine laminations and left hollow. The laminations are sawed out roughly on the band saw, glued together and then the whole is turned up and polished on a lathe. A cross section of such a wheel is shown in Fig. 17. The lathe spindle is attached to the center of the wheel by screwing it into a brass socket, let in flush with the surface.

Miscellaneous Details

There are certain general rules as to details which the model maker will do well to bear in mind.

In the landing gear, wheels, axles and fairings can be constructed in general outline with but little attention to detail. Nose type radiators are generally omitted; the blunt end of the fuselage minus radiator gives approximately the same resistance. Free air radiators placed underneath or at the sides of the fuselage are represented by wire gauze, suitably mounted, about 16 or 18 mesh. Projecting parts of engine, radio apparatus, gun mounts, wind shields, etc., are built to scale but in general outline only. Propellers are left off.

Alignment

Alignment and assembly of the entire model must be done with the greatest care —almost as much care as in the full-sized machine. The process is illustrated in Fig. 18. The fuselage is clamped securely to a plane surface, right side up and with propeller axis horizontal. A pair of similar templates are now made that go under the chord of the upper and lower wings on either side of the body in such a way as to fix the angle of incidence, the stagger and dihedral of each. The interplane struts are now put in place and approximately adjusted, and the lower plane is set to its correct angle of incidence by skimming where it passes through the body. With the aid of the templates, the upper wing is adjusted by turning the struts, the opposite threads on which enable them to act as turnbuckles. After the machine is mounted in the tunnel, it is just as well to check its alignment, no matter how carefully the work has been done.

Satisfaction in a Good Job

Our final illustration is a photograph (Fig. 19) of a good model, just as it is ready to go into the tunnel. Properly stained and varnished, true in every detail, a wind tunnel model, beyond its utility, is a matter of great satisfaction to the model builder. We hope that some of our readers will enjoy the experience of building such a model.

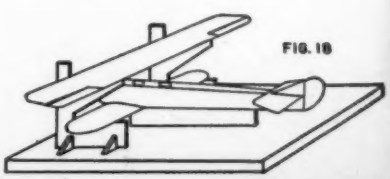


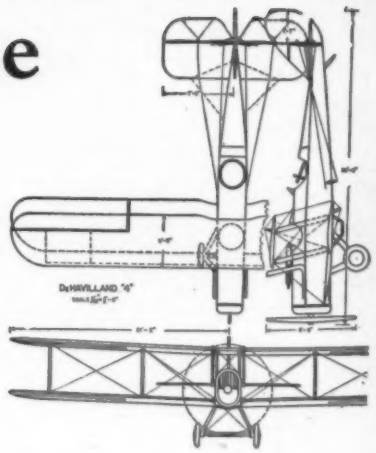
FIG. 18

How the Aeroplane Was Created

How the War Forced Quantity Production of Planes and Thus Laid the Foundation of Commercial Aviation

Chapter No. 9

By DAVID COOPER



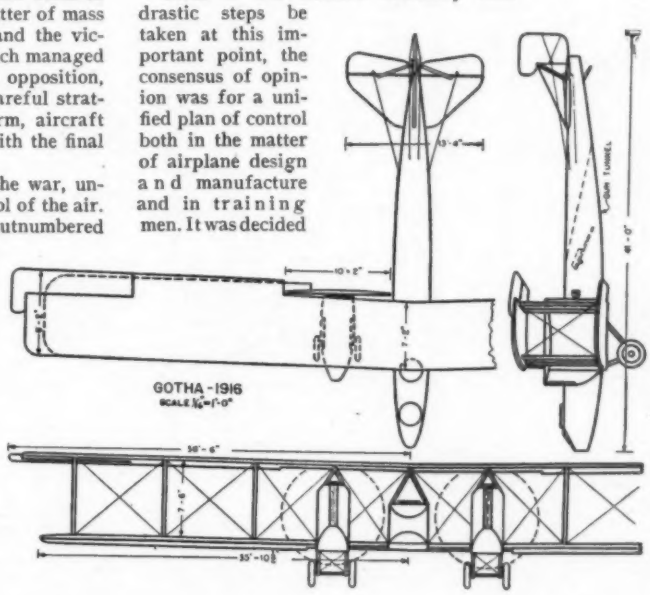
FROM the foregoing chapter, we have seen that the great World War had resolved itself into a mighty struggle and out of this greatest of wars came a new form of combat. No longer was it a matter of mass forces opposing one another and the victory belonging to that side which managed to batter its way through the opposition, but rather a matter more of careful strategy and planning. In this form, aircraft had more than a little to do with the final outcome of the war.

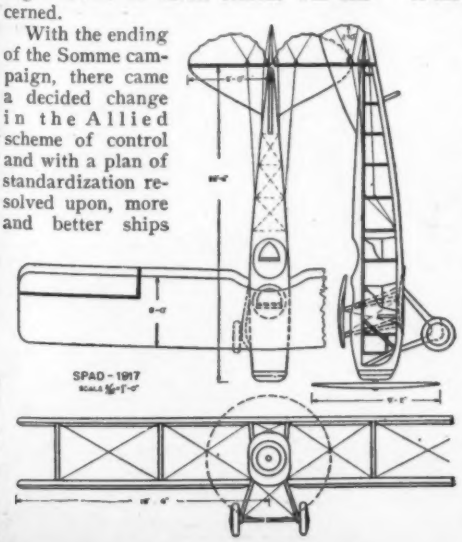
For the first two years of the war, undoubtedly Germany held control of the air. Although the Germans were outnumbered in ships and men by more than two to one, still figuring that they were fighting from the inside and by virtue of a better method of standardization in manufacture, a natural Teutonic characteristic, they were more than able to hold the Allied forces at bay in the air from the beginning of the War until the Battle of the Somme, in the late summer of 1916.

German airplanes, though lacking the speed of Allied ships, were a bit more stable in flight and very hardy in withstanding the trying rigors of warfare. Coupled with this, the better Corps training of the German airmen gave them the edge insofar as aerial combat was concerned.

With the ending of the Somme campaign, there came a decided change in the Allied scheme of control and with a plan of standardization resolved upon, more and better ships flew out from the Allied battle lines. From that time on, in 1916, the real struggle began.

Since it was deemed necessary that drastic steps be taken at this important point, the consensus of opinion was for a unified plan of control both in the matter of airplane design and manufacture and in training men. It was decided to pool all ideas and experiences and by so doing, it would be possible to present a fairly evenly distributed fighting front to the enemy and eliminate as much as possible, weaknesses that were unavoidable under the old hit and miss system. Thereafter the plan was adopted in which certain types of machines fitted for scouting, pursuit, observation, combat or photography were designed with this end in view, instead of expecting any one type to fill the roll of any or all these types. Also, by exchanging the observation of their experiences under actual conditions, much time was saved in experimenting and better ships resulted.





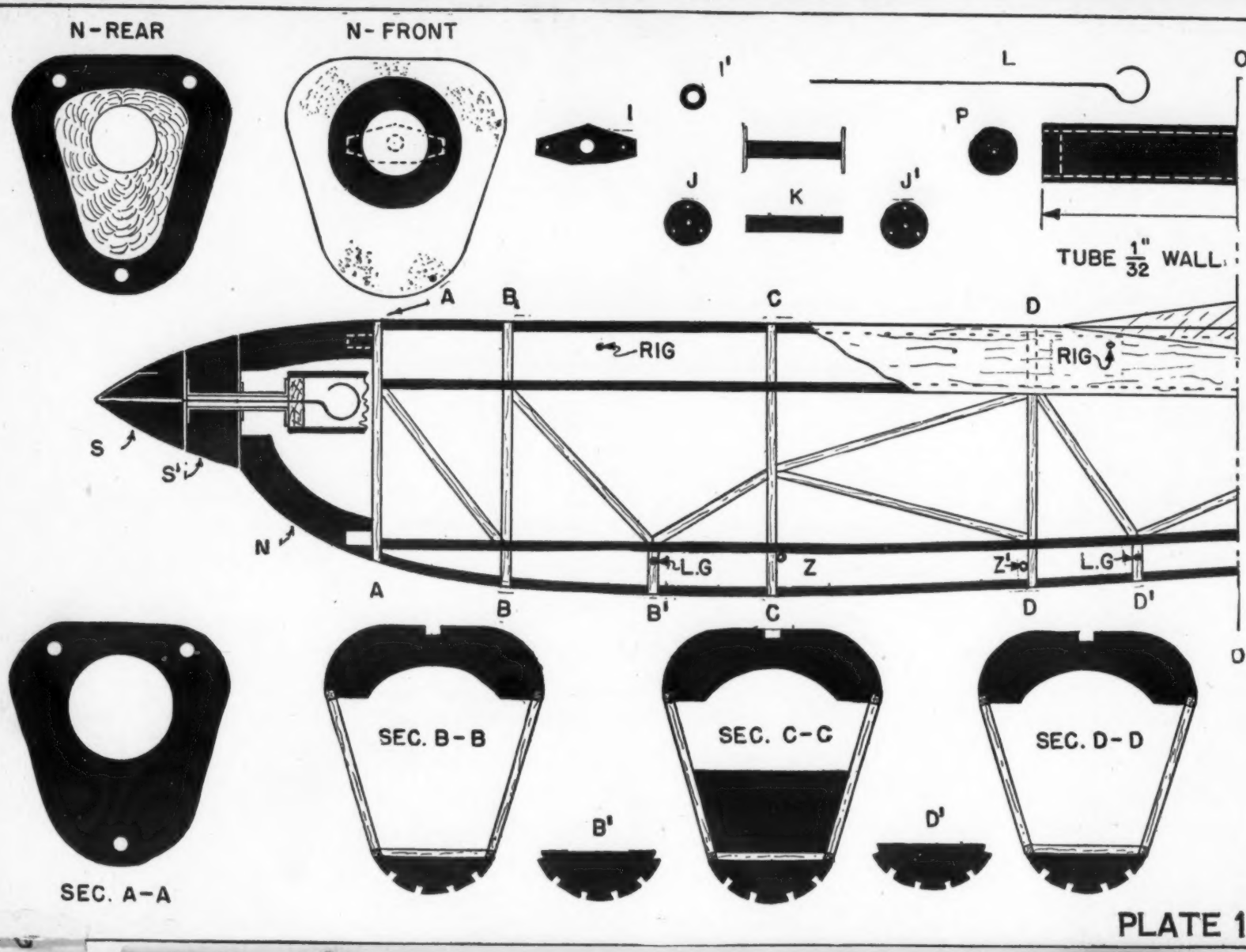
Both French and English designers altered some views they held regarding pushers and tractors, and at various times new experimental models made their appearances, each featuring new ideas, both original and new; and those that had withstood the test of time. Although it was conceded that the tractor offered better flying qualities, yet the pusher with a pilot's nacelle well forward held out the important feature of excellent visibility, and almost as important, an unimpaired range for the operation of the machine-gun.

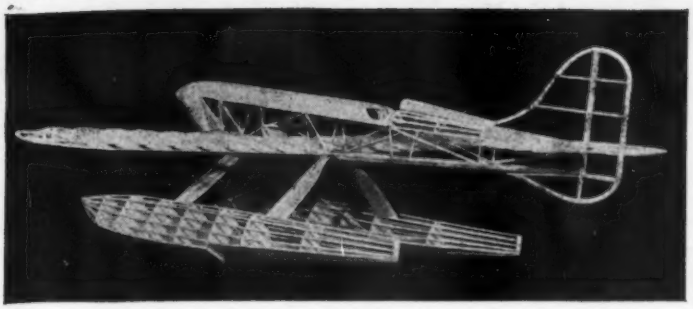
The French Farmans, foremost among this type of ship, gave most efficient results. This, coupled with their increased flying range, armor and equipment for bombing, allowed this model to give a very good account of itself in service at the front.

There were other French types too, for this service, among which were Bleriots, Voisins which were built in increasingly larger sizes, and Breguets. England of course was providing her share, among which were the Shorts for over-water services. Avros and some few Sopwith models were put through also but in small quantities since this company specialized more in ships for combat work. It was in 1916 that seaplanes in doing their routine work, reported the German fleet just before the Battle of Jutland, and this year saw also the first night bombing inaugurated, and also the very first co-operation between bombing planes and ground forces in combat operations.

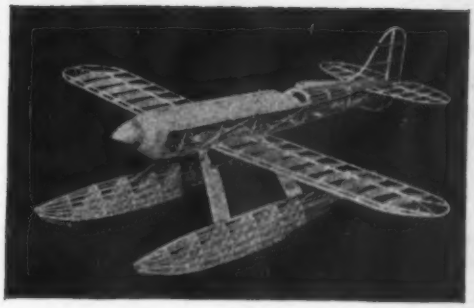
For combat work, England was building SE5s, Avros and the famous line of Sopwiths, including the Triplane, Pup, Snipe and Camel. Among the French of course the best known was the Nieuport famous for its wing and a half and distinctive vee strut. This model was light, fast and extremely maneuverable and was used extensively for combat, being improved from time to time as necessity and conditions warranted. Later on this model was supplemented by the Spad which of course was faster and better in many respects. The Spad was perhaps one of the best ships used by the Allies during the war, since it had no peer in climbing ability and speed. By its unusual qualities of maneu-

(*Continued on page 43*)


N-REAR
N-FRONT
I
I'
L
O
P
J
K
J'
TUBE 1/32 WALL
A
B
C
D
RIG
RIG
S
S'
N
L.G
Z
Z'
L.G
A
B
B'
C
D
D'
O
SEC. A-A
SEC. B-B
SEC. C-C
SEC. D-D
B'
D'
PLATE 1



The uncovered model shows attention to details



A model worthy of your skill

Building the Macchi-Castoldi Seaplane

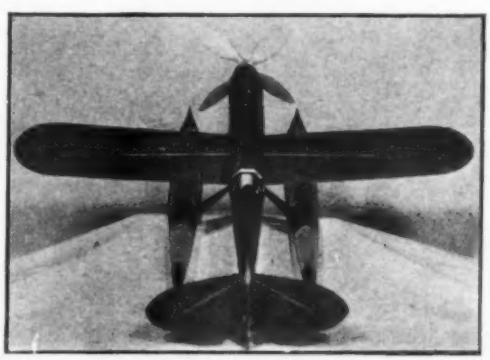
Data and Plans from Which You Can Create a Cleverly Designed Model of the Fastest Airplane in the World

By C. L. BRISTOL

THE "Red Bullet of Italy," more properly known as the Macchi-Castoldi 72 and holder of the world's speed record at 423.7 m.p.h., provides the builder of flying scale models with new and interesting material. Two propellers in close tandem arrangement and revolving in opposite directions provide a power unit that is without torque, a feature of considerable value in the model as well as the large seaplane.

The builder who studies all drawings carefully and reads all instructions prior to beginning work, will have no difficulty in making this model. Its construction is entirely conventional excepting the power plant, in which the rear prop is driven from the rear end of the rubber motor by means of a balsa driving tube and hollow propeller shaft, which in turn acts as a bearing for the front prop of conventional structure.

Plates 1 and 2 joined together at the section lines provide a side view fuselage layout with all stations shown in cross section. The fuselage is made entirely of balsa pieces of the size shown in drawings. Two sides composed of the longerons and all uprights and diagonals between, should be assembled and joined together. Top cross members B, C, D and Q are identical in size and shape and should be sanded together as in rib construction. Observe the heavy lower cross member at the point of greatest stress, section C-C. It is important that this piece be carefully cut and securely cemented in place as it maintains body alignment.



The plane finished, ready to fly

Spinners S and S′ should, for accuracy, be lathe turned and center drilled as one piece, cutting them apart afterward. They are also of balsa and may be shaped by hand where the above equipment is not available to the builder. Propeller blades are cut and carved separately, see Plate 3, and mounted to these spinners on bamboo plugs at an angle of 30 degrees. The balsa nose block is shown in side, top, front and rear elevations. It may be hand-carved and must fit the rear spinner S′ in front and the bulkhead A-A′ at the rear, at which point it is drilled for short pieces of hardwood dowels. These plugs, cemented only to the bulkhead, facilitate easy removal of the nose block, motor, etc.

The driving tube for the rear propeller can be made from a sheet of 1/32″ balsa by soaking in hot water and rolling it around any suitable piece of dowel, pipe or tubing. When dry, the seam can be cemented and the ends trimmed to the correct length. This tube is provided with round end plugs, P and P′ in drawing, and attached to the hollow bearing JKJ′ which is shown assembled at top K. The pieces I, J and J′ are of sheet brass, .45 in thickness, while K is of brass tubing ⅛ inch outside diameter. The center hole in I should fit K, and the plates J and J′ are drilled to fit the front prop shaft L.

Assembly of these parts should be as follows: solder J to K, centering carefully, slip spinner S′ and bearing I on K, placing a fibre washer I′ behind I. Next solder J′ in place and cement to the plug P. In the rear end of this assembly, the pin X and washer X′ form a free bearing which is attached to the fuselage by means of the cross-piece V′, see drawings 2 and 4. V′ of pine or hard balsa, slides across the fuselage between the side blocks V and is removable. The piece U is a rear motor hook of music wire and is secured to the tube T at the plug P′.

In assembling the motor, lace three loops of ⅛ inch flat rubber through the rear hook U and tie the ends in a square knot, making the loops about 11 inches long. By means of a long wire hook, pass the rubber through the tube and cement

(*Continued on page 21*)

Its attitude on the water shows grace and good balance

It actually performs. Its designer, Mr. Bristol, watches a flight expectantly

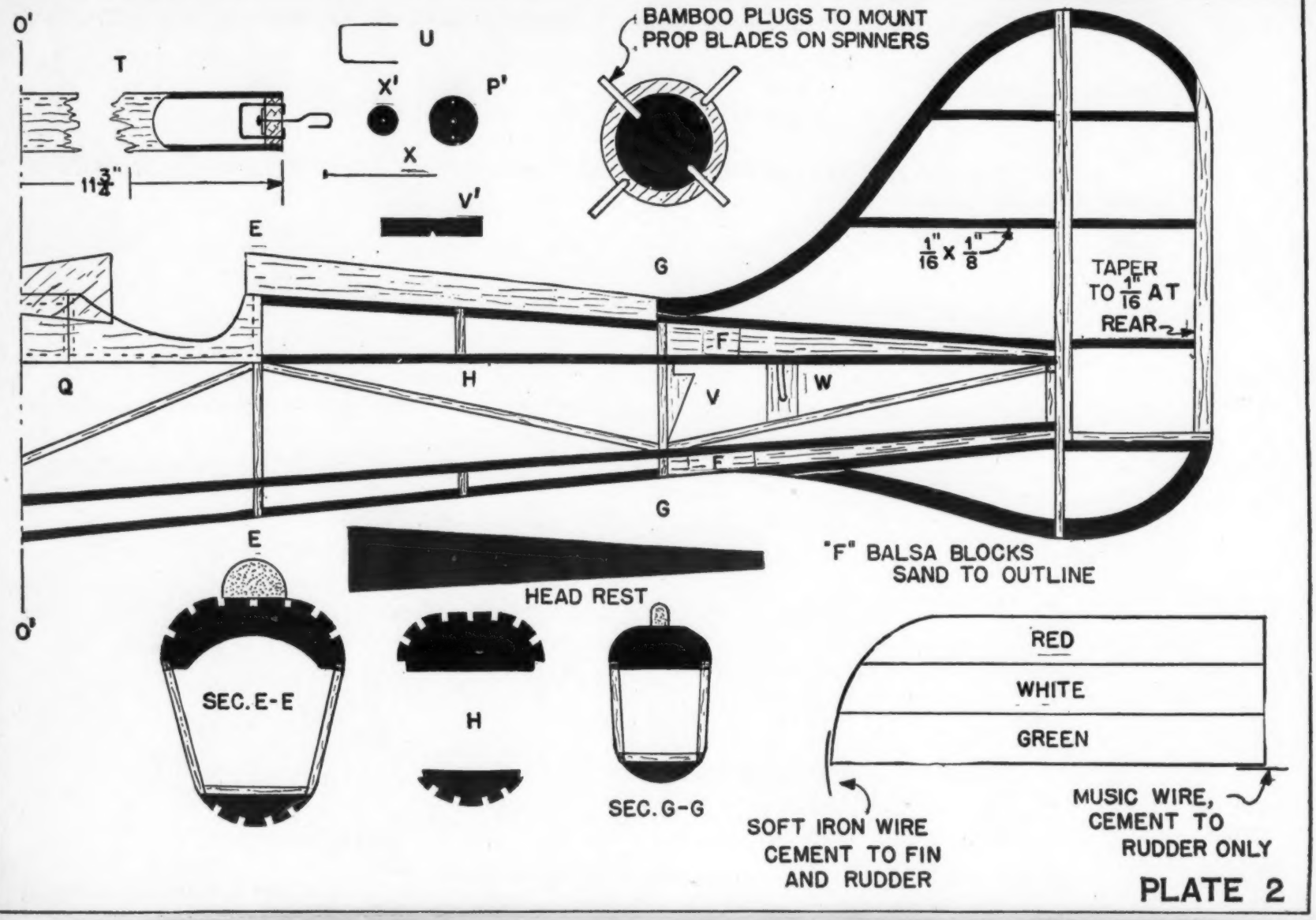
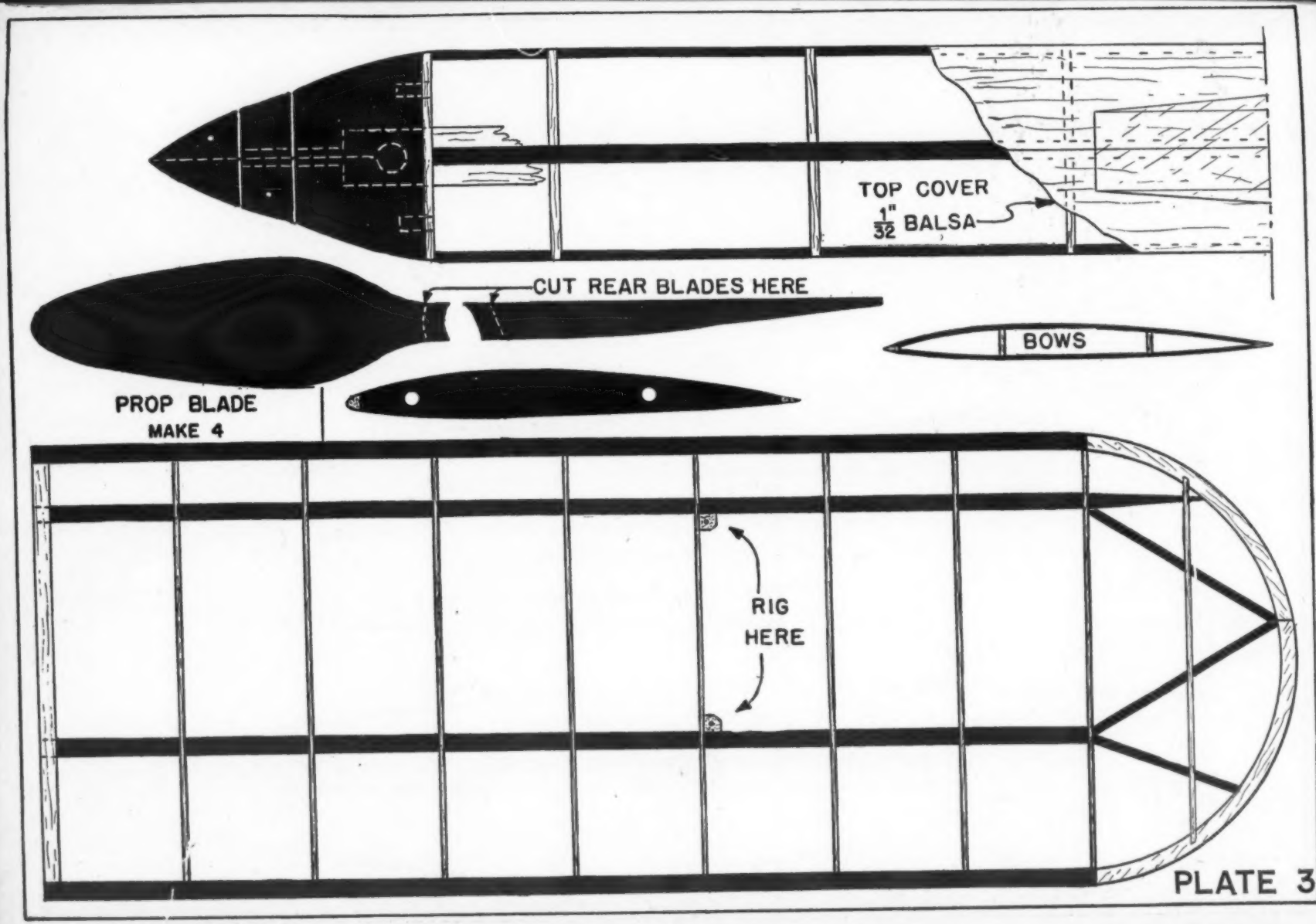

O'
T
U
X'
P'
X
V'
11 3/4"
E
BAMBOO PLUGS TO MOUNT PROP BLADES ON SPINNERS
G
1/16" X 1/8"
TAPER TO 1/16" AT REAR
F
Q
H
V
W
F
G
O'
E
HEAD REST
"F" BALSA BLOCKS SAND TO OUTLINE
SEC. E-E
H
SEC. G-G
RED
WHITE
GREEN
SOFT IRON WIRE CEMENT TO FIN AND RUDDER
MUSIC WIRE, CEMENT TO RUDDER ONLY

PLATE 2


TOP COVER
1/32 BALSA
CUT REAR BLADES HERE
BOWS
PROP BLADE
MAKE 4
RIG
HERE
PLATE 3

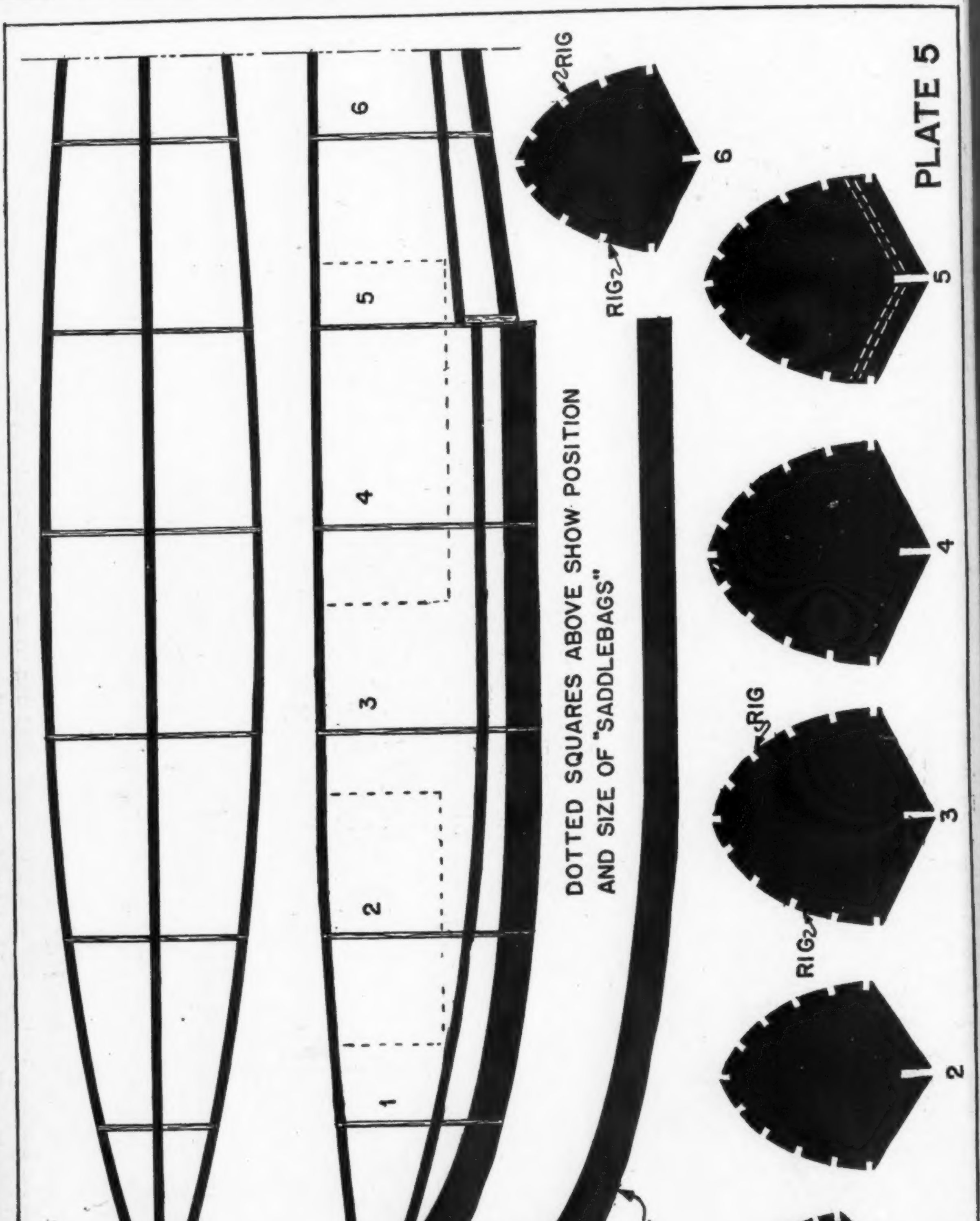


PLATE 5
DOTTED SQUARES ABOVE SHOW POSITION
AND SIZE OF "SADDLEBAGS"
KEEL
RIG
RIG
RIG
RIG
1
2
3
4
5
6
1
2
3
4
5
6

(*Continued from page 17*)

the plug P' in place. Reenforce the rear face of spinner S by cementing a large washer thereon. The front prop shaft L can then be passed through the hollow bearing K and secured to the front spinner S, placing three washers on the shaft. Hook the rubber motor over the hook L and cement plug P in place at the front end of the tube.

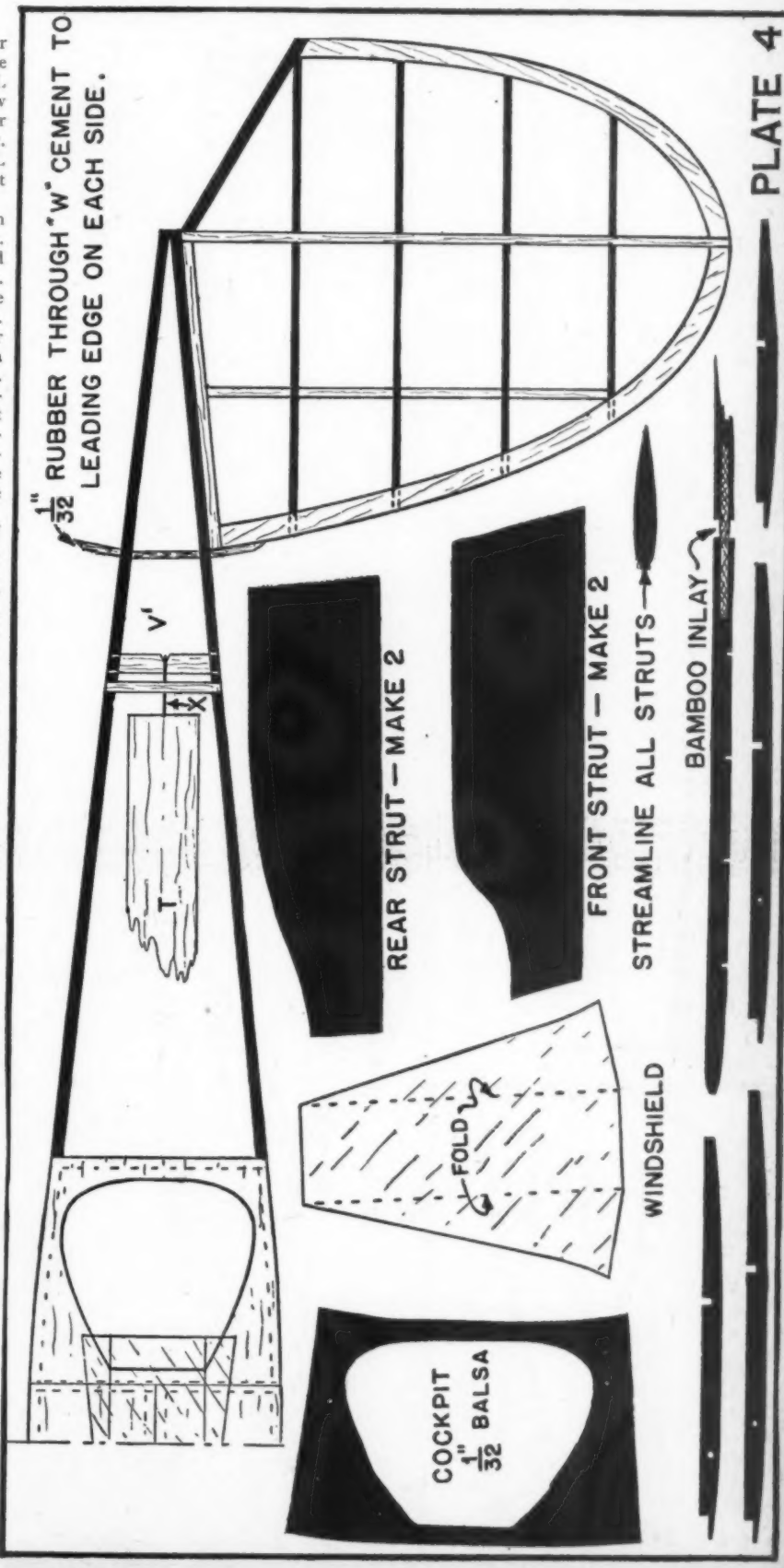
A fin and rudder layout is given on Plate 2 and may be assembled together. Rudder can be cut away afterward and sanded for clearance along its front edge. Wire mountings as shown, will allow the rudder to be moved for circular flights. Plate 4 shows one-half of the stabilizer layout. Observe that the stabilizer has a reversed camber and is also adjustable. Accurate patterns are given for windshield, landing gear struts and cockpit cover. The entire top portion of the fuselage forward of the cockpit is also covered with 1/32" balsa, using a single wide stringer at the top center where the seam occurs.

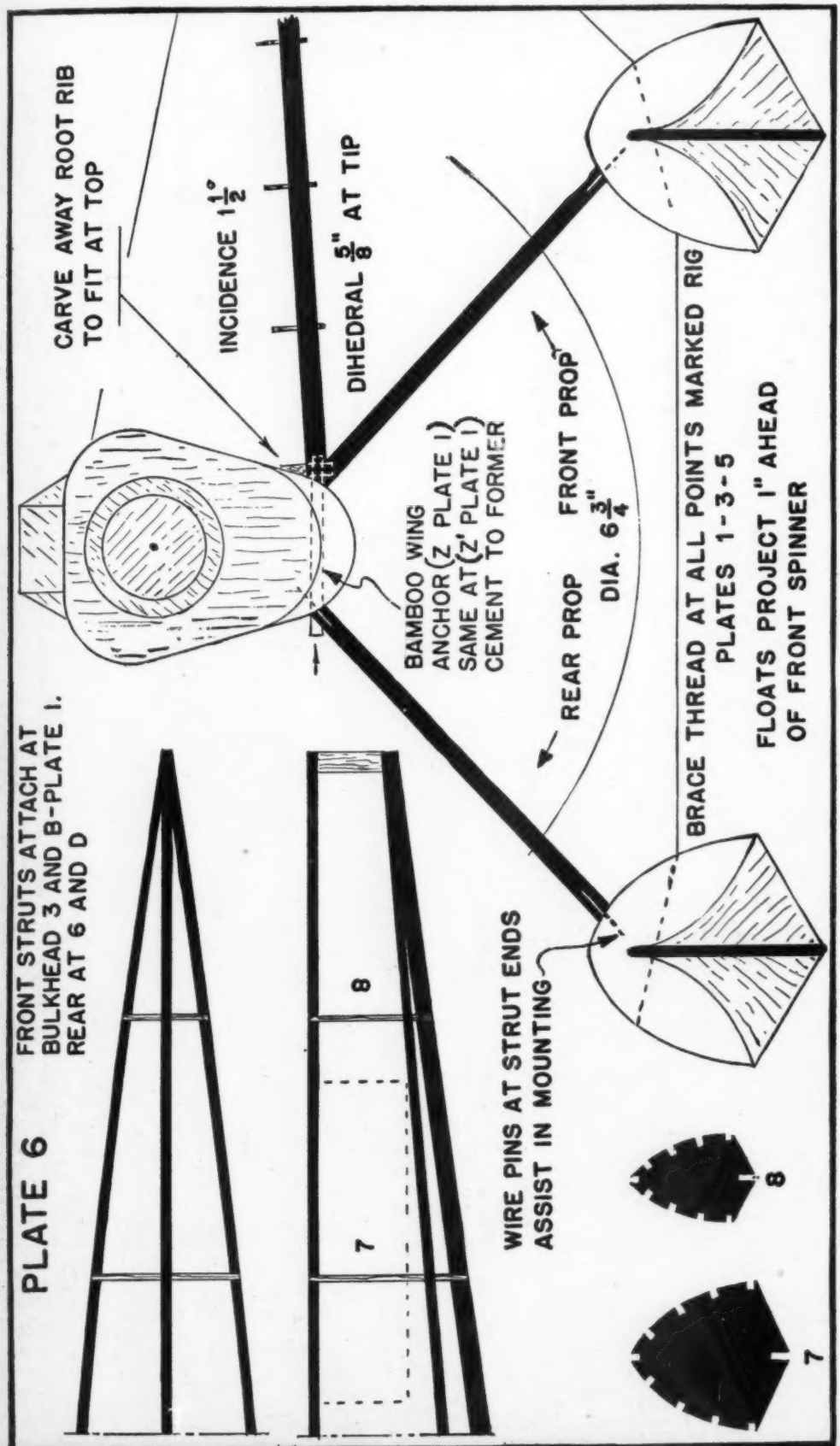
Sixteen ribs of 1/32" stock and two of ⅛" are required in making the wings, layout and patterns appearing on Plate 3. The layout is for the right wing and the builder may have a left wing layout by reversing the root and tip sections. Round balsa spars are used, passing through holes drilled in the ribs. A set of bamboo bows in each wing tip as shown, adds greatly to the appearance and strength at this point. Wing tip outlines are cut from 1/16" balsa. Balsa blocks are placed at the points shown to receive brace thread.

In constructing the pontoons, the builder will require one keel piece and a set of bulkheads, patterns for which appear on Plates 5 and 6. For accuracy the pieces for each float should be sanded at the same time, making two each of all bulkheads and keel. Continuation of the keel behind bulkhead number 5 is accomplished by means of a ⅛ by 1/16" strip, rear uprights or stern posts being of the same material. Dotted lines on bulkhead number 5 indicate the position of strips cemented to its rear side to complete the step. The three top stringers extend the entire length of the floats, while all others are cut at bulkhead 5 and cement thereto in an offset position. Note that one stringer is discontinued behind the step.

Cover the bottom of each float with sheet balsa 1/32" in thickness, which should be worked down with sandpaper to about half of that thickness. All stringers fit closely at the front of the floats and require a little tapering at this point. The builder should cut all notches carefully so as to avoid sagging stringers or other irregularities.

Cover the top portion of each pontoon with strips of red tissue running lengthwise and using as many sections as appear necessary to a smooth job. Shrink with water as in the covering of wings and fuselage. The entire model should be covered with red tissue except the rudder, which bears the Italian insignia shown on Plate 2. Saddlebag radiators on the pontoons may be stimulated with paper patches as shown and should be of a silver color. Paint all exposed wood parts with red lacquer, well thinned, except props and





spinners which are painted with silver dope. Pontoon bottoms may be left in the natural wood and waterproofed with a solution of paraffin and benzine. The entire model should receive two coats of banana liquid as a protection against the splash of landings.

The method of assembling the model and of rigging same with loops of number 20 cotton thread, is clearly shown in the drawings and the builder should be careful to get the floats exactly parallel and in line with the fuselage.

The center of frontal resistance is very low on this model and test flights should be made with a negative stabilizer setting of about 2 degrees. Winding is accomplished by holding the rear prop and winding the front one in the usual way. When released, they will spin in opposite directions. Adjustable tail surfaces make a variety of flights possible.

The "Red Bullet" is a trim little craft, light in weight and quite speedy in flight. It should make a worth while addition to any builder's collection.

Send this List of Material to your dealer

Balsa

1	block	1" by 2"
1	sheet	¼" by 2"
1	"	⅛" by 2"
1	"	1/16" by 2"
10	"	1/32" by 2"
30	strips	1/16" square
6	"	⅛" square
6	"	⅛" by 1/16"

All balsa 18" long

Bamboo

2 pieces 1/16" sq. by 12"

Tissue

1	sheet	white
1	"	green
2	sheets	red

Banana liquid, dope, cement, rubber and small hardware as described.

The Aerodynamic Design of the Model Plane

The Design of Rubber Motors—Basic Factors That Affect Their Operating Efficiency and Results of Tests That Show Their Characteristics

By CHARLES HAMPSON GRANT

Article No. 31 Chapter No. 4

PROBABLY the part of the model plane that receives the least amount of thought in the field of model design, is the source of power. A plane may be well designed and built, yet if it has not a sufficient amount of power properly applied, it can easily be a failure.

Many model builders are ingenious up to the point of applying the motive power, only to ruin a good model by slapping a few rubber strands onto it without considering the requirements carefully. Perhaps it is because rubber bands are such a convenient and simple means of driving the propeller, that they feel serious thought about the matter is unnecessary. If the problem was a difficult one that required the designing of a complicated apparatus to drive the propeller, the builder might think it more worthy of his consideration. Although rubber band power for models seem simple, it really demands careful thought if the best results are to be obtained.

There are other sources of power besides rubber bands, such as gasoline engines and spring motors. However, they have not found favor because of their complexity, expense and the fact that until recently, devices of this type have never operated satisfactorily. Gasoline engines have recently been developed that are practical however, and they are finding greater favor from day to day.

Spring motors have never proven their worth, chiefly because of the low power output for the weight of the motor. The best spring motor will weigh about five times as much as rubber bands in which the same amount of energy can be stored. Because of this fact, as well as their simplicity and inexpensiveness, nearly all of the models being built at the present time are powered with rubber bands. Their efficiency is illustrated well by an indoor flight of 22 minutes which was recently made at Akron.

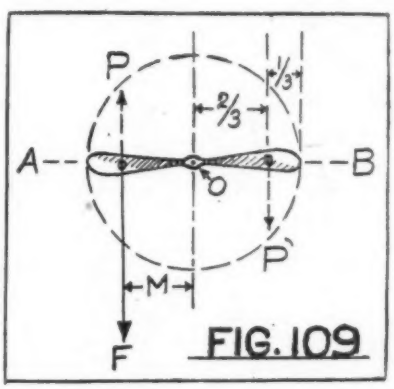


FIG. 109

Because of their popularity, our discussion will deal chiefly with rubber motors as a source of power. Gasoline engines will be given very brief consideration in the latter part of this chapter.

Rubber Band Motors

In determining what is the best source of power and how it should be applied, there are just three basic considerations to keep in mind. They are (1) the amount of torque or twisting effort that a motor will deliver at the propeller; (2) the amount of time during which this torque continues to be delivered; and (3) the coordination of the rubber motor with the particular propeller being used, so that it turns the propeller at the most *efficient* speed and delivers its power in proper amounts over as long a period of time as possible.

Torque (Turning Effort)

Suppose we consider the first factor, *Torque*. What is it and why is it of prime importance? It may be defined as the twisting or turning effort that is imparted to the propeller by the motor. It can be measured by winding the motor and allowing one blade to rest on a delicate scale which will register the pressure or the force exerted by the blade at its point of contact with the scale.

In Fig. No. 109, we will suppose that the propeller blade is pressing on the scale at (F) with a force equal to (F). The point of the blade at which the force is being applied to the scales is a distance (M) from the propeller shaft (O). Then the torque exerted by the motor on the propeller is (FxM) inch ounces, if the force is measured in ounces and the distance (M) in inches. No matter where the force (F) is acting on the blade, the torque is always the same, other conditions being equal. In other words, the torque (T) always equals the product of the force exerted at any point times the distance of that point from the axis of rotation (O) or T=(F×M). *(Continued on page 42)*

TORQUE TABLES — HAND WOUND. NO LUBRICANT.

TABLE 1 — STOCK = BROWN RUBBER 1/8" X 1/30". LENGTH = 1 FOOT

NUMBER OF STRANDS	20	50	100	150	200	250	300	350	400	TURNS AT BREAK	TORQUE AT BREAK
2			0.35		0.5		0.65		0.85	450	1.00
4	0.3	0.7	1.15	1.45	1.8	2.15	2.7			320	3.00
6	1.0	1.3	2.0	2.60	3.5	4.8	← Torque			270	5.20
8	1.6	2.5	3.3	4.3	5.9		In Inch-Ounces			220	7.20
10	2.4	3.9	5.4	7.5	9.8					208	10.00

WT. OF RUBBER:- 14.5 FT. = 1 OZ. STRETCHED 8.5 TIMES ORIGINAL LENGTH

TABLE 2 — STOCK = BLACK RUBBER 1/16" X 1/30". MOT. LENGTH = 1 FOOT.

TURNS →	20	50	100	150	200	250	300	350	400	TURNS AT BREAK	TORQUE AT BREAK
2STRDS			0.35		0.5		0.70		1.00	450	1.50
4 "	0.35	0.8	1.05	1.4	1.85	2.00	2.75			340	3.10
6 "	0.95	1.15	1.90	2.50	3.40	4.50	← Torque			282	5.30
8 "	1.50	1.35	3.00	4.10	5.40	7.30	In Inch-Ounces			258	7.70
10 "	2.20	3.90	5.50	7.20	10.00					216	11.00

WT. OF RUBBER:- 17 FT. = 1 OZ. STRETCHED 9.5 TIMES ORIGINAL LENGTH

TABLE 3 — STOCK = BLACK RUBBER 1/16" X 1/32". MOT. LENGTH = 1 FOOT

TURNS →	50	100	200	300	400	500	600	700	800	TURNS AT BREAK	TORQUE AT BREAK
2STRDS	0.04	0.05	0.09	0.13	0.17	0.22	0.27	0.33	0.38	848	0.45
4 "	0.23	0.35	0.50	0.70	0.90	1.15				516	1.25
6 "	0.35	0.45	0.60	0.90	1.30	NO OF TURNS				448	1.50
8 "	0.50	0.70	1.20	1.90		150	200	250		360	2.30
12 "	1.00	1.20	———	———	———	200	250	350		294	5.00

Torque In Inch-Ounces

TABLE 4 — STOCK = BLACK RUBBER 1/32" X 1/32". MOT. LENGTH = 1 FOOT

TURNS →	100	200	400	600	800	1000	1200		300	TURNS AT BREAK	TORQUE AT BREAK
2STRDS	0.02	0.05	0.06	0.08	0.10	0.13	0.19			1332	0.25
4 "	0.08	0.13	0.18	0.25	0.37					802	0.48
6 "	0.17	0.24	0.38	0.56						632	0.80
8 "	0.17	0.32	0.57							512	1.00
12 "	0.50	0.67	1.45						0.95	436	1.80

Torque In Inch-Ounces

TORQUE TABLES — HAND WOUND. LUBRICANT USED.

TABLE 5 — STOCK = BROWN RUBBER 1/8" X 1/30". MOT. LENGTH = 1 FOOT.

TURNS →	50	100	200	300	400	500	600	700	800	TURNS AT BREAK	TORQUE AT BREAK
2STRDS	0.20	0.35	0.50	0.63	0.75	0.85	0.95	1.15		724	1.2
4 "	0.90	1.00	1.25	1.65	2.10					472	2.9
6 "	1.60	1.75	2.50	3.50	5.00					420	5.8
8 "	2.30	3.00	4.50	7.00						320	8.7
10 "	3.40	4.20	6.20	10.00						316	12.4

Torque In Inch-Ounces In All Tables.

TABLE 6 — STOCK = BLACK RUBBER 1/16" X 1/30". MOT. LENGTH = 1 FOOT.

TURNS →	50	100	200	300	400	500	600	700	800	TURNS AT BREAK	TORQUE AT BREAK
2STRDS	0.20	0.35	0.45	0.75	0.60	0.75	0.88	1.15		700	1.15
4 "	0.60	0.80	1.20	1.55	2.10					496	3.00
6 "	1.15	1.65	2.35	3.10	5.00					420	5.90
8 "	2.00	2.80	4.10	6.20						375	7.80
10 "	3.50	4.85	6.00	8.50						330	11.20

TABLE 7 — STOCK = BLACK RUBBER 1/16" X 1/32". MOT. LENGTH = 1 FOOT

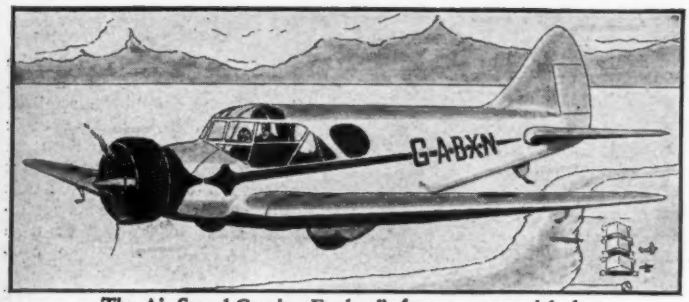
TURNS →	50	100	200	300	400	500	600	700	800	TURNS AT BREAK	TORQUE AT BREAK
2STRDS	0.07	0.13	0.16	0.19	0.21	0.22	0.24	0.26	0.30	928	0.45
4 "	0.23	0.26	0.31	0.40	0.50	0.65	0.90			620	1.00
6 "	0.38	0.43	0.60	0.80	1.00					496	1.40
8 "	0.52	0.60	0.90	1.20	1.50					440	2.00
12 "	1.10	1.50	1.90	2.50	3.30					416	4.20

TABLE 8 — STOCK = BLACK RUBBER 1/32" X 1/32". MOT. LENGTH = 1 FOOT

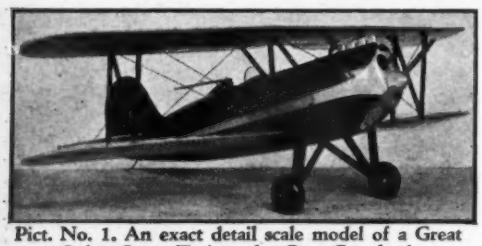
TURNS →	100	200	400	600	800	1000	1200		300	TURNS AT BREAK	TORQUE AT BREAK
2STRDS	0.02	0.03	0.04	0.05	0.06	0.10	0.12			1280	0.20
4 "	0.07	0.10	0.16							740	0.40
6 "	0.15	0.24	0.38							624	0.75
8 "	0.20	0.32	0.56							584	1.05
12 "	0.42	0.60	1.10						0.84	528	1.85

AIR WAYS
HERE AND THERE

What Readers Are Doing to Increase Their Knowledge of Aviation in All Parts of the World. Send Pictures and Details of Your Experiments



The Air-Speed Courier, England's fastest commercial plane



Pict. No. 1. An exact detail scale model of a Great Lakes Sport Trainer, by Cary Crawford

Pict. No. 2. A "Bull Pup" that won a first prize for George Hargraves. (A plane not a dog)

Pict. No. 4. A six foot "Thunder Cloud" camera model built by Bill Ruttkay from plans in Universal Model Airplane News

MODEL fans who did not attend the National Model Airplane Competition held at Akron, Ohio on June 27th, 28th and 29th, missed the best contest that has ever been staged in this country. All official contests are now held under the guidance of the National Aeronautic Association and full details of the Akron Meet appear in the Junior N.A.A. section of this magazine. Therefore, if you will turn to this section on page 28, you will find complete results with many interesting highlights of the Contest. More facts and pictures which may straggle in to the editor, will appear in the next issue. There will be some unusual "shots." Look for them.

Though there was a National Contest at Akron recently, all other activity did not cease. There are many who could not attend but who have been extremely active with their pet hobby.

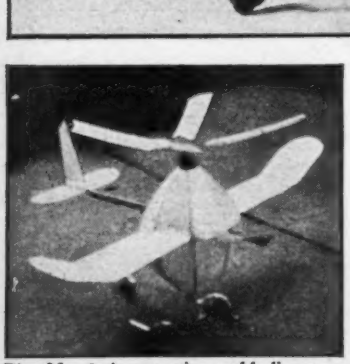
Harland C. Wood of Middleton, Mass., again sends us a very clever drawing of another prominent airplane. It is the Air Speed Courier, England's fastest commercial plane. Several of these ships are entered in the England to Australia race, as will be noted in the FRONTIERS OF AVIATION, appearing in this issue.

Cary Crawford, Jr., of 537 East Waldburg Street, Savannah, Georgia, sends us the finest photograph for Air Ways section this month. It is picture No. 1, which shows his Great Lakes Sport Trainer. It is built up in great detail, having a span of twenty inches and the full scale number of ribs, formers and stringers. It is certainly a swell looking job. From the picture, it is evident that there are many other excellent details to this ship which Mr. Crawford does not mention in his letter.

Picture No. 2 shows a Buhl "Bull Pup" built by George Hargraves of 525 South Garfield, Pocatello, Idaho. It won first prize in a recent contest held in his home town. It is a non-flying model but is built up in great detail. The body construction consists of bulkheads and is covered with 1/64" balsa veneer. It has such details as instrument panel, stick and rudder pedals, bucket seat, safety belt, throttle, air speed indicator, movable control surfaces, laminated wood prop, bolts in the motor and navigating lights on wings and rudder. It is a ¾" scale model with a wing spread of twenty-two and one-half inches. Hargraves says this is the first scale model he has ever built. We will be interested to see what he can do after he has been at this work for a few years.

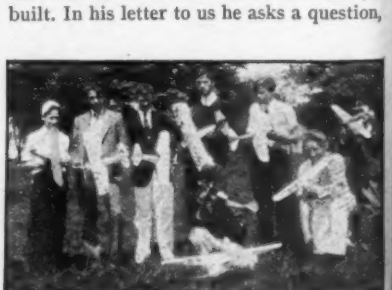
Winners of contests that think they are pretty good had better take notice. Theodore Baxter of 41 Nat Avenue, New Bern, N. C., sends us picture No. 3, of his Curtiss Goshawk. It is a flying scale model of twenty inches span. Baxter tells us it is the one hundred and third model he has built. In his letter to us he asks a question,

Pict. No. 5. A wind tunnel model built by Clinton A. Schmaling. It is only one of many tested in his experimental laboratory

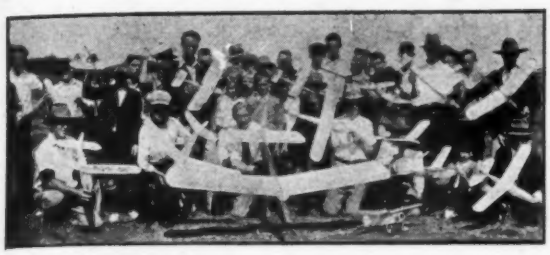


Pict. No. 6. An experimental helicopter-airplane built by Bartan Cowan

Pict. No. 3. A flying scale Curtiss Goshawk by Theodore Baxter, not a large ship



Pict. No. 11. Youngstown, Ohio has an active model club. Here are some of its members. William Bernstein is its proud parent



Pict. No. 13. A group of Australian model builders at a recent contest, won by Jack Lowther

Pict. No. 15. M. Pierre Legros sent this picture of the members of the first model airplane club to be formed in France

which we will endeavor to answer here. "Why are the outside of the pants left open?" The answer can be very forcibly impressed upon anyone in doubt as to why this is so, if they would assume the role of mechanic at one of the fields. If it is necessary to change a tire or repair a wheel, of course the wheel must be taken off. In this event, if the pants extended down over the outside of the wheel, it would be a difficult job. With one-half pants the wheel is easily slipped off and yet the streamline effect is present.

Some time ago we published plans for a six foot camera model called the Thunder Cloud. A number of the boys have built and flown it successfully. One of them is Bill Ruttkay of 346½ Carrine Street, Johnstown, Pa. He sends us picture No. 4 of his model. Upon flying this model after it was completed, he says that some of the flights were erratic. He managed to correct the trouble by lowering the motor nacelles one-half inch below the position shown in the plans. As editor of the magazine, I know this model to be an excellent ship and suggest that builders interested in models of this size get busy constructing it. You will be pleased with the results.

At Millerton, New York, there lives a gentleman named Clinton A. Schmaling, who has been interested in models for some time. Being of rather an inquisitive nature, he has set up his own wind tunnel and has proceeded with research along aeronautical lines. One of the wind tunnel models which he is using, is shown in picture No. 5. It is of his own design. He hopes that soon he will be able to build a ship powered with a Cirrus 95 h.p. air-cooled engine. Mr. Schmaling carries on his work because of his intense interest in this activity, not merely for monetary gains.

In picture No. 6 we have a very unusual creation of Barton Cowan of 1021 Laramie Street, Atchison, Kansas. It is novel, to say the least, and Cowan deserves a lot of credit for original thinking. He tells us it is supposed to be a helicopter and actually performs, going up fairly straight and then gliding down for a smooth landing. The duration is thirty seconds. It has a wing spread of thirty-four inches. Our Air Ways column is longing to see a few more original designs of this nature. Those of you who may be bashful, we hope will overcome your timidity and let us know what you are doing.

There have been a number of young men who have been consistent Air Ways contributors in the past, and we wish to express our great appreciation for their enthusiasm in this work and for their great help in making Air Ways attractive to our readers. We are, therefore, listing some of their names:

Henry J. Jewett, Ken Willard, Gordon Light, Hugh Butterfield, Harry Trimble, R. Rymer, George Wilson, John B. Hastings, Arnold Smith, Jack H. Berry, J. E. Schafer, Cedric Galloway, Harry E. Moyer, Joe Kovel, Bill Brown, Glenn Courtwright, Thurston De Groff, Harvey Schubring, William T. Howell, Elbert Weathers, Neil Secor, Bob File, Alan D. Booton, DeBremond Hoffman, Maynard Clark, William Petersen, Ludwig Bielko, C. W. French, Jr., Lawrence McCready, Frank Zaic, Harland C. Wood, William C. Drake, Jim Talcott, Robert Sweet.

(Continued on page 38)

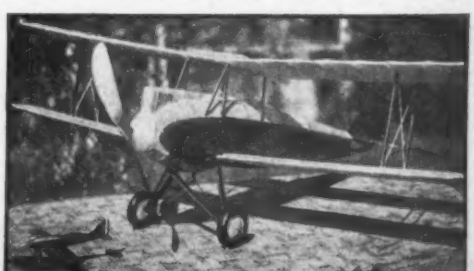
Pict. No. 7. Bob File and James Kilbourne enjoy flying this six foot S.E.5

Pict. No. 12. A group of Australian indoor model fans who "know their stuff." (Courtesy I. Freshman)

Pict. No. 8. A nine foot Stinson keeps company with a twenty inch Corsair, by Carl J. Scherer

Pict. No. 10. A beautiful flying scale Travelair Speedwing, by John Zimmerman

Pict. No. 9. Some expert builders belonging to the Beloit, Wisc. Model Club. Conrad Hansen Jr., is Secretary

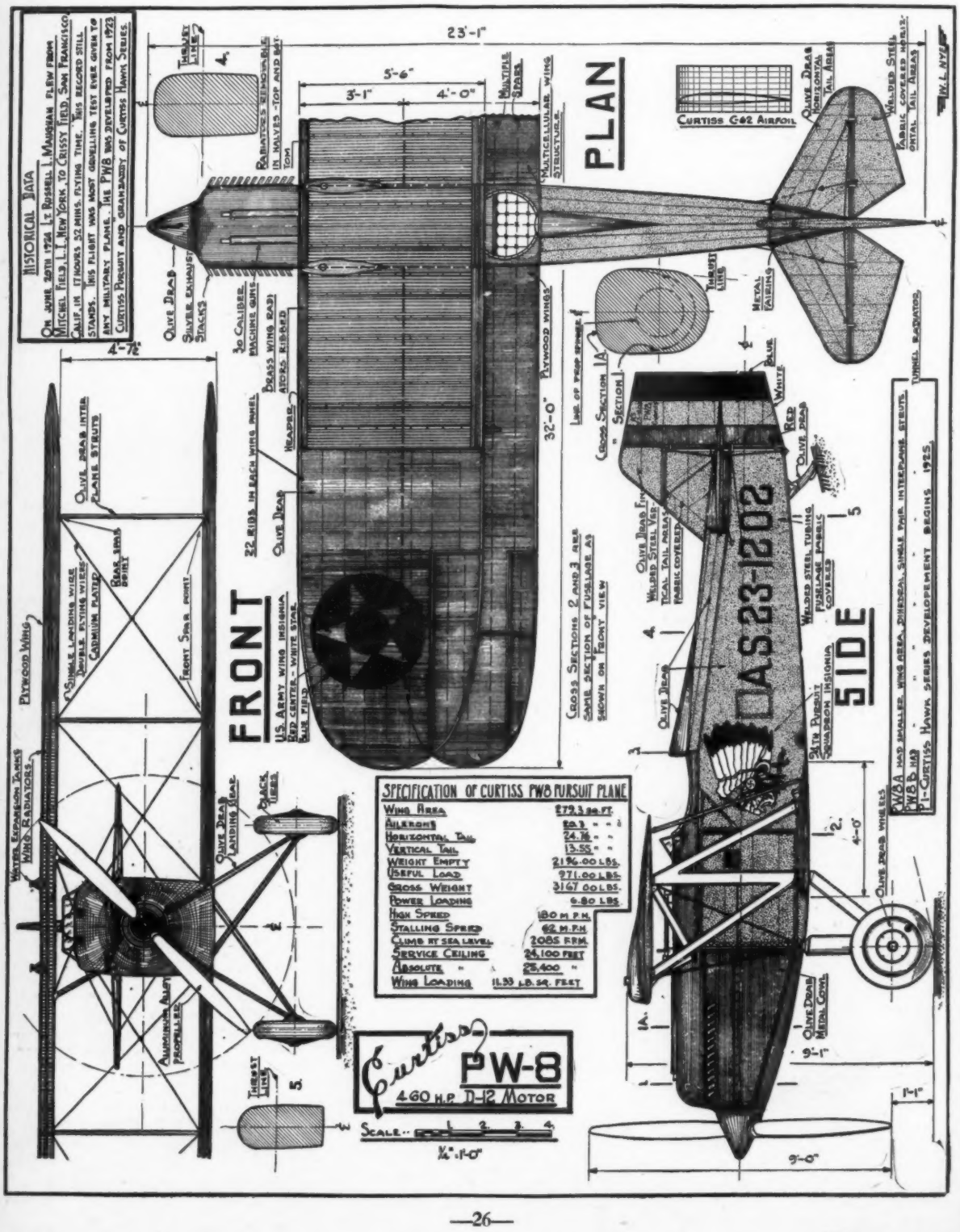


Pict. No. 14. E. Howell of Australia believes in going to extremes. Two of his models

The Curtiss Pursuit U.S. Army Air Corps PW-8

THE Curtiss PW-8 pursuit plane in which Lt. Russell L. Maughan flew from New York to San Francisco on June 23rd, 1924, in record time, establishing the ideal of a "dawn to dusk" trans-continental flight, was constructed by the Curtiss Aeroplane and Motor Corporation. This type combines maximum speed, climb, visibility, maneuvering qualities and general adaptability to military requirements. This type is the outgrowth of development from the original Navy and Army racers previously constructed and holding the world's speed records at that time. The

(*Continued on page 35*)



Illustrated Aviation Dictionary

Many model builders and other readers are often in doubt with regard to the meaning of common aeronautical words. A number of them will be defined each month, therefore, in order to give readers a larger scope of understanding.

By EDWIN T. HAMILTON

47. **BAROGRAPH.** An instrument which makes a permanent record in ink of the various altitudes attained by an aircraft in flight.

48. **BAY.** The portion of the face of a truss, between adjacent bulkheads or adjacent struts or frame positions.

49. **BIPLANE.** An airplane with two main supporting surfaces, or wings, one over the other.

50. **BODY.** Same as *fuselage.*

51 **BRACE WIRE.** See *wire, brace.*

52. **BRACE-WIRE BRACKET.** A light, metal stamping used to attach the brace wire to the surfaces which it braces.

53. **BUMP.** A natural disturbance of air currents which causes uneven or rough flight. "The airplane hit a bump." "The air was bumpy."

54 **CABANE.** The framework to which the wings are braced at the fuselage. This term is also applied to the system of short struts upon the wing of an airplane to which the stays, landing wires, etc., are secured.

55. **CABIN.** An enclosed cockpit of any aircraft. The enclosure of an aircraft designed to accommodate passengers and pilot.

56. **CAMBER.** The heighth of the curve of a wing surface from the front or leading edge, to the rear or trailing edge. *Top camber* refers to the top surface of a wing, and *bottom camber* refers to the bottom surface of the wing.

57. **CENTER OF GRAVITY.** The point of an aircraft at which the resultant of all the weights of an aircraft acts. The one point on which an aircraft would balance itself longitudinally and laterally when in contact with nothing but that point. That point in an aircraft about which all other parts, which are acted upon by the attraction of gravity, balance each other in every position.

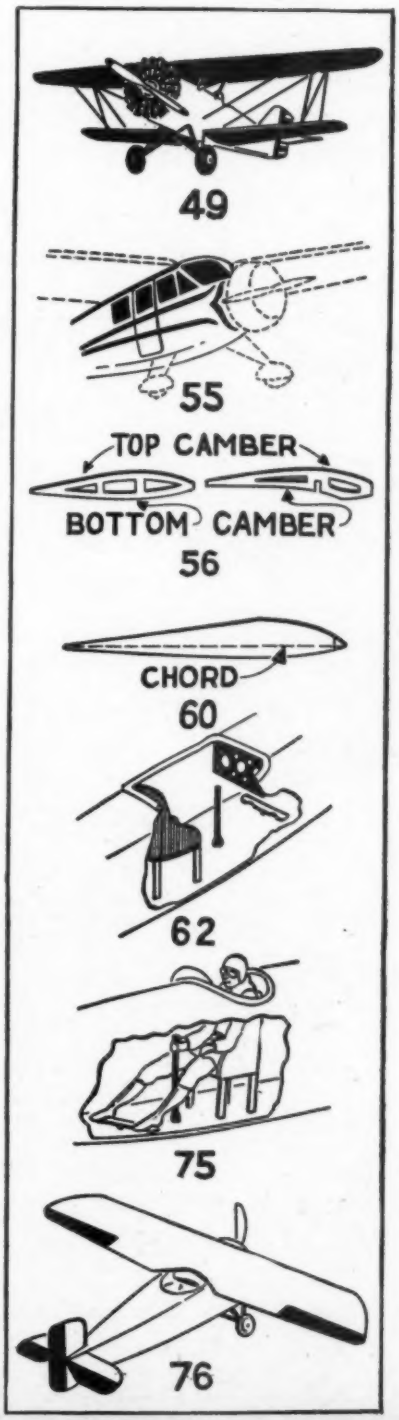
58. **CENTER OF MASS.**. Same as *center of gravity.*

59. **CENTER OF PRESSURE.** Usually used in reference to an airfoil. See *airfoil.* The point at which the surface of an airfoil is intersected by the resultant force of all the pressures acting on its surface.

60. **CHORD.** The width of the wing from front or leading edge, to rear or trailing edge, measured parallel to the line of flight.

61. **CLIMB INDICATOR.** An instrument which indicates the amount of a dive or a climb of an aircraft.

62. **COCKPIT.** The open spaces in the fuselage or body, of an airplane which accommodate the pilot, and in which the controls and instruments are housed. The forward section of an airplane cabin which accommodates the pilot or pilots, and the controls and instruments.



63. **COMPASS.** An instrument which indicates the magnetic north, the dial of which is so graduated as to indicate all directions. The most important instrument on an aircraft.

64. **COMPRESSION MEMBER.** Same as compression rib. See *rib, compression.*

65. **COMPRESSION RIB.** See *rib, compression.*

66. **CONNECTING ROD, TAIL-SKID.** See *tail-skid connecting rod.*

67. **CONTACT.** The act of switching on the ignition of the motor of an aircraft. Word used as a warning to the man starting the propeller that the switch is on.

68. **CONTROL COLUMN**. Same as *control stick.*

69. **CONTROL HORN**. See *horn.*

70. **CONTROLLABILITY**. The degree to which an aircraft may be controlled by the pilot.

71. **CONTROLLABLE PITCH PROPELLER.** See *propeller, controllable pitch.*

72. **CONTROLS.** A general term applied to the apparatus provided for operating the devices which control the speed, direction, balance, altitude and motor power of aircraft.

73. **CONTROLS, AIR.** The devices employed for operating the control surfaces of aircraft.

74. **CONTROLS, ENGINE.** The devices employed for operating the power output of the engine or engines.

75. **CONTROL-STICK.** A vertical lever which operates the longitudinal and lateral control surfaces of an airplane. Pitching is mastered by a forward and backward movement of the stick, while rolling is controlled by a side-to-side movement.

76. **CONTROL SURFACES.** The surfaces which control the action of an aircraft in motion. These are the ailerons, the elevators and the rudder.

77. **CONTROL WIRES.** Any and all wires, cables or other devices used to connect the controls with the control surfaces.

78. **COWLING.** A removable covering which extends over the top and sides of the motor, over the portion of the fuselage just in front of the front cockpit, and sometives over a portion of the fuselage at the back of the rear cockpit. It is used to decrease wind resistance and protect the parts inclosed.

79. **CRACK-UP.** An accident in which the plane is damaged. Usually used to designate a partial wreck, or one of minor degree.

80. **CRASH.** A fall or landing in which the plane is badly damaged. This

(Continued on page 37)

NATIONAL AERONAUTIC ASSOCIATION JUNIOR MEMBERSHIP NEWS

New Champions Set New Records at 1934 National Championship Model Airplane Meet as Only One Champion Repeats

Twenty Three Minutes New Indoor Record

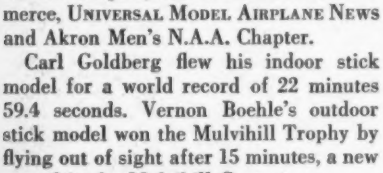
All Illustrations Courtesy Akron Beacon Journal

WHO can ever surpass such records? That is the question being asked by those junior members of the National Aeronautic Assocation who attended the 1934 National Championship Model Airplane Meet at Akron, Ohio, June 27-29.

Twenty-three minutes indoors, models flying out of sight outdoors. That is what happened when 183 junior members of the N.A.A. gathered from all parts of the United States, Canada and England to compete for honors and awards in the meet sponsored by the Akron Women's N.A.A. Chapter, Akron Chamber of Commerce, UNIVERSAL MODEL AIRPLANE NEWS and Akron Men's N.A.A. Chapter.

Carl Goldberg flew his indoor stick model for a world record of 22 minutes 59.4 seconds. Vernon Boehle's outdoor stick model won the Mulvihill Trophy by flying out of sight after 15 minutes, a new record in the Mulvihill Contest.

Maxwell Bassett, the only champion to repeat, again demonstrated his mastery by



Behind the firing line. Contestants working on their models at Akron Municipal Airport

winning the Texaco Trophy for gasoline powered models with a flight of 21 minutes 57 seconds, establishing a new record for such models under the new N.A.A. rule that limits the amount of fuel which may be carried.

Jim Cahill was winner of the Stout Outdoor Trophy when his fuselage model flew for the excellent time of 4 minutes 28.2 seconds. This is the only type of model failing to set new records at this year's meet.

Herbert Greenberg won the Stout Indoor Trophy with a flight of 19 minutes 04.6 seconds, a new senior record for the event. This same Greenberg did some other meritorious flying and if there were an all-around national champion, he would have a strong claim for the 1934 title, closely tied by Vernon Boehle.

Marvin Schmidt, competing in the Moffett International Contest, won the Admiral Moffett Memorial Trophy with a flight of 2 minutes 42 seconds and defeated entrants from Canada, England and the United States.

Emmanuel Enderlein won the Bloomingdale Trophy by flying his indoor fuselage model 13 minutes 24 seconds. This is a new world record that eclipses the former mark by nearly three minutes.

Mary Roll, the only girl contestant, congratulates Vernon Boehle, winner of the Mulvihill Contest

Louis Casale scored 97.8 points to win the UNIVERSAL MODEL AIRPLANE NEWS Trophy with his near perfect exhibition scale model of a Waco Taperwing. Mike Kostich won the subdivision of the exhibition contest for lighter-than-air craft with his beautiful model of the U.S.S. MACON, scoring 96 points.

Contestants and officials declared the 1934 Meet the best ever held. Flying conditions indoors and out were just about perfect. Plenty of records were established. Even the weather set a new high temperature record when the thermometer registered officially 100 degrees during the day of the outdoor flying.

But all this is ahead of the beginning of the meet's story. Contestants began to arrive in Akron as early as Friday, June 22, when Bill Atwood and Irwin Ohlsson with the latter's mother arrived by automobile from Los Angeles. From then on to the last day of the meet there were steady arrivals by every mode of transportation, plane, bus, train, automobile, motorcycle, bicycle, and on foot. There were the usual number of hitch-hikers.

Two enterprising young men, both 17 years of age, Carlton Harris and Charles Thomas, came to Akron from their homes in Buffalo, pedaling a 33 year old tandem

Dr. Theodore Troller, Contest Director, congratulates Louis Casale, winner of Scale Model Contest. C. Nelson Black, at left, placed second

bicycle, behind which they pulled a trailer containing their models, tools and supplies. Despite plenty of hard luck on the trip, tire trouble, storms, sun, etc., they made the grade and arrived in plenty of time to take in all the meet and show the rest of the country's model builders that they knew their models. Both did very well in the flying contests. Harris was nursing so much sunburn after the trip that he visited the hospital for treatment.

The Ohlssons and Bill Atwood were on the road from California almost nine days and brought their own camping outfit. They set up camp in most business-like fashion near the Guggenheim Airship Institute and "Shorty" Fulton gave them the use of one of the vacant offices in the Airport Administration Building for their workshop. Their gasoline models made many successful flights in tuning up for the meet. One of these models was too heavy and Goodyear engineers came to the rescue by designing and building new rubber tires of very light-weight construction.

Of the 183 registrants, tabulations indicated that 76 were repeaters from the

1933 meet in New York City. There were also a number who missed the 1933 Meet but had attended other National Championship Meets in previous years.

A newcomer to the Nationals this year was Mary I. Roll of Dearborn, Michigan. Mary's brother Michael is an oldtimer and Mary herself knows plenty about models. She was the only girl to register and enter the meet as a contestant.

Meet Headquarters was in the Mayflower Hotel where the hotel's genial manager, C. J. Fitzpatrick, had set up registration desks on the second floor and a workshop in the basement. The registration was expertly handled by the ladies of the Akron Women's N.A.A. Chapter who answered millions of questions and handed each contestant a large envelope that contained a volume of information, cards, badge, lunch tickets and admission tickets to entertainment features.

Miss Eileen Fulton, Airport Manager's daughter, holding sunshade while Captain Willis C. Brown prepares Captain Bowden's English model for flight

Mrs. W. W. Milar, Women's Chapter President and Dr. Theodore Troller, Director of the Guggenheim Airship Institute who acted as Contest Director for the meet, greeted the contestants and their accompanying parents or friends. Registration continued well into the night of Wednesday, June 27.

Meanwhile in the exhibition room adjoining, the scale models were on display, having already passed preliminary tests which permitted only the most perfect models to enter the final judging. Three expert judges, Dr Wolfgang Klemperer of the Goodyear-Zeppelin Corporation; Lieutenant Commander George V. Whittle, U.S. Navy, and R. F. Kitchingman, pilot-manager of Air Services, Inc., after much careful examination, unanimously awarded first place to Louis Casale, Syracuse, N. Y., marking his detailed Waco Taperwing model 97.8 points of a possible 100. Second place went to C. Nelson Black, Columbus, Ohio, for his excellent Vought Corsair which scored 96.1 points. The excellence of the scale models this year was far above the average of former years. Casale's model was complete even to working brakes on the wheels and gas and oil in the tanks. The beautiful model of the U.S.S. MACON, built by Mike Kostich of Akron, scored 96 and was a wonderfully complete and detailed model, undoubtedly the finest model of a lighter-than-air ship ever built by a boy, far surpassing many display models built by adult ex-

Lieutenant Commander George V. Whittle, U. S. Navy; Dr. Wolfgang Klemperer and R. F. Kitchingman, judges of the scale models

perts. There were 27 exhibition models in the final judging.

A most interested observer and official was Mr. Guy Scott, Assistant Superintendent of the Pennsylvania Railroad. This was Mr. Scott's first experience with model airplane meets, but because of his unusual organizing ability, the people of Akron asked him to be the General Chairman of the Meet Management. He lived up to his reputation and the 1934 Meet became the most completely and best organized of all National Championship Meets. Many committee meetings were held preparing for the occasion and untold work was done to make it such a complete success. Too much praise cannot be given Mr. Scott for his

John Stokes, new junior champion, with his indoor stick model

energetic management and his well chosen appointments.

The capable and energetic efforts of Mrs. W. W. Milar and her Women's N.A.A. Chapter also had a great deal to do with the smooth running of all arrangements. Those who know Mrs. Milar, know that anything she undertakes will prove completely successful. It is no exaggeration to say that without Mrs. Milar, there would not have been a National Championship Meet in Akron this year. She has been the hardest working National Aeronautic Association official in the field ever since its formation and is at present Vice Chairman of the N.A.A. Membership Committee. Her vision has long seen the wonderful value to the youth of the country of a well conducted educational program in aviation matters, and as a result over four hundred students in Akron Schools are under N.A.A. guidance. Truly Mrs. Milar has demonstrated through her own efforts and those of her Chapter members, that there is a definite place in model aviation as well as aeronautics generally, for women.

Large delegations arrived from many cities where the National Aeronautic Association has Junior Chapters. Philadelphia, Boston, Newark, St. Louis and other cities were especally well represented. Mr.

Mrs. W. W. Milar and Wiley Post show keen interest in scale model

Victor R. Fritz and Mr. Jesse Bieberman brought the Philadelphia group. Captain Willis C. Brown was in charge of the Boston party. Mr. Nathan Polk led the large number from Newark. Mr. Claude E. Carmichael and Mr. H. T. Sommers had a big group from St. Louis. All of these gentlemen are leaders of N.A.A. junior groups. Mr. Charles H. Grant, Editor of UNIVERSAL MODEL AIRPLANE NEWS, represented the magazine and was responsible for getting several of the New York delegation to the meet. To name all the interested and active N.A.A. workers who attended the meet would make a small edition of "Who's Who in Model Aviation."

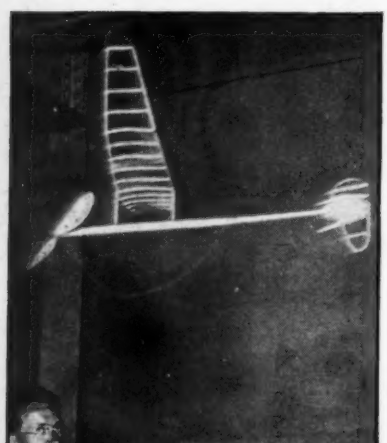
The Canadian delegation was the largest ever. In all there were 17 entries from Canada. Mr. C. J. MacKinnon, Secretary of the Model Aircraft League of Canada, brought many of the Canadian entrants from Toronto. Others flew in from Hamilton, Ontario. The entrants

from Canada are always among the prize winners.

Attending these large meets is like attending a class reunion. Every year brings the regulars back together again to renew old friendships and exchange new ideas that keep the model game alive throughout the nation. Occasionally one of the oldtimers does not show up. Several were missing this year among whom were John Bartol, last year's Stout Indoor Champion, and Albert Levy, Bloomingdale Contest Champion. Bartol is now a midshipman at the United States Naval Academy and Levy is in poor health. Consequently those two 1933 champions were not able to be present to defend their championships.

The workshop in the basement was open and bustling with activity until the early hours of the morning. There were work benches, chairs, microfilm tanks and everything needed to repair or construct model airplanes. This room opened off the street and many a passerby stopped for a glimpse of the unusual sight.

All day Wednesday there were sightseeing trips that took in the Akron Municipal Airport, Goodyear-Zeppelin Airdock, the various rubber factories and the Guggenheim Airship Institute. These trips were in private automobiles of the hospitable Akron people who wanted their



Carl Goldberg, center, watches his winning model come down "dead stick" to set a new world record of 22 minutes 59.4 seconds

visitors to see their city and its activities.

Wednesday evening after the scale models had been finally judged, many of the contestants and their friends attended an excellent variety show in Central High School auditorium put on by the best of Akron's own talent, including the Akron University Glee Club. This was one of the Meet's specially arranged features.

Early Thursday morning, June 28, everybody went out to the airport for the outdoor flying. Dr. Troller had enlisted the services of "Shorty" Fulton, the airport manager, and Mr. H. M. Jellison who

Jim Cahill, winner of the Stout Outdoor Contest

acted most efficiently as the meet's Field Judge in charge of all details connected with the contests. These energetic gentlemen had everything laid out and organized so thoroughly that the flying went ahead on schedule as soon as the light fog had lifted. Members of the Women's N.A.A. Chapter acted as clerks ably directed by Mr. Jellison's expert assistants, Mrs. Jellison and Mrs. Ruth Harrington. The weighing in scales were mounted in closed light delivery trucks that kept all traces of the slight breeze out and made the weighing process easy and accurate.

Dr. R. H. Holbrook was Operations Officer and in short order had all his helpers and timers on their job and the big meet was on. The large group of officials was assisted by Akron's older Boy Scouts who helped out in timing and pursuing models.

There was scarcely any wind and the sun was out to set a season's temperature record. The thermometer registered

Herbert Greenberg, winner of the Stout Indoor Contest, and his winning model

an even 100 degrees for several hours during the day. This heat did not help rubber motors which could be heard breaking during their winding up process with the customary disastrous results. But those models that succeeded in gaining ample altitude soon found friendly thermal currents and many a model never returned to earth in sight of the chasing builder and timers.

It was not long before Vernon Boehle had his single tractor model up for an out of sight flight that lasted 15 minutes. When last seen the model was high in the air and apparently climbing still higher. Nobody could equal or surpass this flight so Boehle became the 1934 winner of the Mulvihill Trophy. There were many other flights in which the models went out of sight but they did not remain in sight as long as the winner.

Later in the day, Jim Cahill, a fellow member of Boehle's Indianapolis N.A.A. Junior Chapter, succeeded in getting his fuselage model up for the Stout Outdoor Contest winning flight of 4 minutes 28.2 seconds and who should be pressing Cahill for first place but Vernon Boehle

Maxwell Bassett, national gas engine model champion, with his "Miss Philadelphia," winner of the Texaco Trophy

himself whose best fuselage model flight was 4 minutes 10.8 seconds.

Meanwhile, the Akron Beacon Journal was conducting a special towline-launched glider contest for Ohio contestants. This event was won by Robert File of Columbus. His glider model rode a thermal current and was lost to sight after soaring 23 minutes 13 seconds to a new record for weighted model gliders. This record so far surpasses the former record that it is in a class by itself, the former record being less than two minutes.

It was after lunch before the gasoline powered models began to perform satisfactorily in the Texaco Contest. There were nineteen contestants with gasoline powered models, the largest number to ever assemble in one contest. Many of the

fellows had more than one model so that there were in all 26 gas engine models in the 1934 meet. Unfortunately, only eight succeeded in making an official flight as some of the models were damaged in practice flights and some had engine trouble. Maxwell Bassett's "Miss Phildelphia" finally got away for an excellent flight of 21 minutes 57 seconds carrying only 1⅝ ounces of fuel in accordance with the N.A.A. new limited fuel allowance rule. Bassett's chief competitor was Joe Kovel who succeeded in getting 14 minutes 02 seconds with his second best model. Kovel's best one had been damaged beyond repair earlier in the day when it landed in front of a moving automobile. As usual the tiny gasoline engines drew the crowd when their noisy exhaust announced that one was about to take off.

At noon, time was taken out for the lunch that was furnished to all contestants

Robert File, whose towline launched model glider set a world record of 23 minutes 13 seconds

by the Akron sponsors of the meet and served by the ladies of the Women's Chapter. Everyone was so interested in the flying that not much time was used for eating. The contestants all felt that such excellent flying conditions were too good to miss.

Until 2:30 the American and Canadian entrants in the Moffett International Contest were trying to qualify for the finals. There were 84 American and 12 Canadian contestants in the Moffett Contest eliminations. Of these, six Americans and five Canadians qualified for the finals in which there were also four entries from England. The winner of the final was Marvin Schmidt who made a flight of 2 minutes 42 seconds. His best qualifying flight was 6 minutes 06 seconds. This was also the best flight made by a rubber powered fuselage model in the whole day of flying.

Five models were received from England for the Moffett International Contest, but that of Mr. P. Date was so badly crushed in shipping that it could not be flown. The four other British models were flown by proxy as the owners could not accompany their models to America. The four proxies were: Captain Willis C. Brown, Mr. Charles H. Grant, Mr. Victor R. Fritz, and Mr. B. P. Pond. The British models were all beautifully made and strong, steady flyers, but the general opinion was that their propellers were of insufficient diameter. The highest place won by a foreign model was sixth place by J. W. Kenworthy of England, whose best time was 1 minute 29.4 seconds.

The American proxy flyers were not sparing in their efforts to help the English entries win. They did their best and put everything they had into the task. With a little more luck one of the British models might have been caught in ascending air currents and won the contest.

The contestants were arranged in

Emmanuel Enderlein, about to launch his indoor fuselage model, winner of the Bloomingdale Trophy

groups of fifteen with four officials handling each group. One group was set aside for the open age class contestants who numbered seventeen altogether in all the various events. Considering that this is the first time in recent years that the older fellows have had an opportunity to compete in a National Meet, it is indicative of the considerable interest among the older group of model builders and flyers. In the outdoor contests, the older class did not fare so well, failing to set any outstanding marks for duration flying. It seems that they need more flying practice which the new N.A.A. rules will provide in allowing them to compete in sanctioned meets.

Competition was close throughout the day. Nobody was sure who would be the ultimate winners as there were always good flights being recorded. As an example, in the Mulvihill Contest, Robert Nevin placed second with a flight of 12 minutes 45 seconds when his model went out of sight. With a little better fortune, this flight might have been the winner. It has already been pointed out how closely Boehle was pressing Cahill in the Stout Outdoor Contest. Robert Huddleston placed second in the Moffett International Contest with a good 2 minutes 28 seconds, only 14 seconds behind Schmidt. It is of particular interest to note that those three, Boehle, Huddleston and Cahill are all from Indianapolis. There must be something in the secrets of the Indianapolis N.A.A. Junior Chapter that insures success in outdoor model flying. Every year the flyers from that city make winning flights.

Marvin Schmidt, with his model that won the Rear Admiral William A. Moffett Memorial Trophy

Finally, at six o'clock, the outdoor events came to an end. The day had been so thirst provoking that a check up on the water consumption revealed that 75 bottles of five gallons each of water had been consumed and the soda water stand had handled five truckloads of bottled soda water. There was an abundance of sunburn and dark tanned complexion as a result of the day's exposure.

All day the public address system installed on the field was busily announcing the new records, calling for lost officials, strayed contestants, playing "canned" music and otherwise making itself useful and entertaining. During the day several persons of prominence made short addresses to the crowd of several thousand. One of these speakers was Mr. C. W. Seiberling, famous in the rubber manufacturing world, who is an ardent model airplane enthusiast. Mr.

Frank Hackett, N.A.A. Governor for Ohio was present on the field the whole day and was a most interested observer and official.

With the sun setting, the airport became once more its usual self as the model flyers trouped back to the city to prepare for the next day's indoor flying. Most of the contestants were driven back in private cars but those who were not so lucky, made the return trip in busses. "Shorty" Fulton enjoyed the day so much that he is already stirring up another outdoor meet for his beloved airport. Akron is indeed fortunate to have such a hustling manager.

After all the contestants had left the field, the administration tent was taken down and the clerical staff with its mass of records went into executive session in the Mayflower, working far into the night to record the flights and determine the winners and placing positions of those who did not win.

For evening entertainment Thursday, all contestants, their parents and friends were admitted to the Akron Armory to witness the wrestling matches. Some very fast action wrestling was served out and the boys were enthusiastic in their voiced approval of this sort of entertainment.

After the wrestling most of the contestants stayed up into the early morning getting their indoor models in shape for the Stout Indoor and Bloomingdale Contests. It was demonstrated that these delicate microfilm models could be transported safely as several contestants brought their models, fully covered, more than 500 miles without damage, but many of the fellows wanted to be sure and waited until the night before the indoor contests to apply the microfilm. They had some fine looking models for indoor flying, almost without exception all were covered with microfilm. Only one paper covered wing was observed.

The indoor contests were held in the Goodyear-Zeppelin Airdock, which had very kindly been turned over to the management of the meet by the Goodyear Company. Because there was so much highly valuable material stored in the Dock, it was stipulated that only contestants and officials to run the indoor contests were to be permitted to enter during the day. This caused some of the boys much disappointment, but all those who could not be admitted, with their parents and friends were taken out into the country for a wonderful day's outing at one of the largest Boy Scout Camps in the United States.

The Dock came up to the expectations of the contestants. A large space had been cleared for the flying and there were no appreciable air currents to cause models to drift, once the sun had reached an altitude sufficient to warm the whole roof. There was a clear vertical space of 180 feet, completely free from hanging lights, wires, or other obstructions. But even with this tremendous height, many models reached the girders at the top.

There was not much of excitement in the indoor flying until about eleven o'clock, when John Stokes, a lad of thirteen, flew his indoor stick model for a new junior record of 17 minutes 03 seconds. He had set a new junior record only a few days before in Philadelphia which was considerably less than this new 17 minute record. After letting his rubber motor expand a short while, Stokes made another flight, this time setting a new world record of 18 minutes 19 seconds. It began to look as though the 1934 indoor champion would be a junior. However, in the afternoon, Carl Goldberg, after only one practice flight, flew his stick model for a new amazing world record of 22 minutes 59.4 seconds. Carl took only one official flight feeling that his new record would stand. However, being in the open age class, Goldberg could not be the winner of the Stout Indoor Trophy. It remained for Herbert Greenberg to win the trophy with an excellent flight of 19 minutes 04.6 seconds. Altogether six contestants beat the 1933 record for indoor stick models. John Stokes tried again, using his last official flight, and made 18 minutes 53.4 seconds for a new junior record.

The Bloomingdale Contest for indoor fuselage models produced a closely contested event. Emmanuel Enderlein won the Bloomingdale Trophy when his model set the new world record of 13 minutes 24 seconds. He was very closely pressed by John Young whose model did 13 minutes 15 seconds. A junior, Hyman Oslick, placed third with 12 minutes 59.4 seconds setting a new junior record. As the indoor flying time limit arrived, Herbert Greenberg was attempting to get his model wound up for one more flight, as though he had not already won enough. As it was, he placed fourth.

As on the day before, the Akron ladies served lunches to all in the Airdock. Again the fellows did not take much time out for eating, being too intent on flying in the world's best structure for indoor models.

At six o'clock the dock had to be vacated and all the flyers went back to the city to join their comrades who had returned from their outing. The next event on the program was the much anticipated banquet and everybody wanted to hear the speakers, see the famous personages, and receive their awards.

Promptly at seven forty-five those at the speakers table were seated. The banquet was in the Mayflower's beautiful ball room and over 400 were there. Every table had as hostess, one of the ladies of the Women's Chapter. The room was beautifully decorated and very colorful. Due to unusually warm weather, the gentlemen were permitted to remove their coats. While an excellent dinner was being served, musical entertainment was provided by a talented orchestra and the Alumni Singers of Akron Central High School.

Mr. C. W. Seiberling acted as toastmaster and was well received by the boys. Seated at the speakers' table were Mrs. Milar, Wiley and Mrs. Post, Jimmy and Mrs. Doolittle, Akron's Mayor, Hon. I. S. Myers, Congressman Dow W. Harter, Mr. and Mrs. Frank Hackett, Charles H. Grant, Phil Henderson, Manager of the Cleveland National Air Races, Mr. and Mrs. H. M. Jellison who had so successfully carried out the mechanical and clerical arrangements of the meet, Mrs. J. H. Renick, Akron Chairman of N.A.A. junior activities, Howard F. Rough, U.S. Aeronautic Supervisor for Ohio, George H. Meyers, President, Akron Chamber of Commerce, Miss Frances Alexander, Akron Secretary of N.A.A. junior activities, Mr. Guy Scott, Dr. Theodore Troller and others.

Representing the National Aeronautic Association, Lieutenant H. W. Alden awarded the trophies and other prizes. Altogether there were 155 awards, including cups, trophies, medals, binoculars, stop watches, barometers, magazine subscriptions, books and other items. When the final award had been made, the 1934 National Championship Model Airplane Meet was officially at an end and Akron had won a host of friends from among the nation's model aviators.

Besides the four major sponsors the following are deserving of appreciation: Goodyear-Zeppelin Corporation for the use of the Dock; Whitfield Paper Works for Whitfield Trophy; Bloomingdale Brothers, donors of Bloomingdale Trophy; The Balsa Wood Company, donors of Admiral Moffett Memorial Trophy; The Texas Company, donors of Texaco Trophy; Mr. William B. Stout, donor of Stout Trophies; Comet Model Airplane Company, who awarded the Comet Trophy; Mr. Ernest A. Walen, donor of Springfield Trophy; Scientific American for three yearly subscriptions; and many others too numerous to mention. Without the wholehearted co-operation of many people, such an event as the 1934 Meet would not be possible.

RESULTS OF 1934 NATIONAL CHAMPIONSHIP MEET

MULVIHILL CONTEST
For Outdoor Stick Models

1. Vernon Boehle, 19, Indianapolis, 15 minutes. (New Mulvihill record)
2. Robert S. Nevin, 18, Cleveland, 12 minutes 45 seconds.
3. Fred Skafec, 15, Akron, 8 minutes 21.6 seconds.
4. Herbert Greenberg, 18, Newark, N. J., 7 minutes 24 seconds.
5. Robert Huddleston, 17, Indianapolis, 4 minutes 49.2 seconds.
6. Leslie Adams, 17, Peru, Indiana, 4 minutes 06 seconds.
7. Albert Courtial, 17, St. Louis, 4 minutes 02.4 seconds.

8. Bruno Marchi, 18, Medford, Mass., 3 minutes 49.2 seconds.
9. Russell Yungbluth, 17, St. Louis, 3 minutes 46.3 seconds.
10. John Freeman, 16, Indianapolis, 3 minutes 28.8 seconds.
11. Ralph Kummer, 18, St. Louis, 3 minutes 16 seconds.
12. Edward Booth, 20, Hamilton, Ontario, 3 minutes 12 seconds.
13. John Malloy, 20, Columbus, Ohio, 2 minutes 59.4 seconds.
14. Mary I. Roll, 18, Dearborn, Michigan, 2 minutes 47.4 seconds.
15. Paul Mignard, 19, Cleveland, 2 minutes 39 seconds.
16. Eli Ross, 16, Columbus, Ohio, 2 minutes 38 seconds.
17. Harry Edsall, 20, Marion, Ohio, 2 minutes 36 seconds.
18. Daniel J. Clini, Springfield, Mass., 2 minutes 36 seconds.
19. James A. Zimmer, 15, Syracuse, N. Y., 2 minutes 36 seconds.
20. August Ruggeri, 18, New York City, 2 minutes 33 seconds.
21. William Robinson, 16, Cleveland, 2 minutes 28.8 seconds.
22. Clarence Wilkinson, 20, Akron, 2 minutes 27.6 seconds.
23. Harold Schwede, 19, Lakewood, Ohio, 2 minutes 27.4 seconds.
24. Gordon S. Light, 18, Lebanon, Pa., 2 minutes 27 seconds.
25. Gerald Ritzenthaler, 18, Prairie View, Illinois, 2 minutes 27 seconds.

STOUT CONTEST
For Outdoor Fuselage R.O.G. Models

1. James Cahill, 16, Indianapolis, 4 minutes 28.2 seconds.
2. Vernon Boehle, 19, Indianapolis, 4 minutes 10.8 seconds.
3. Lawrence Smithline, 17, New York City, 3 minutes 46.8 seconds.
4. Julius Takacs, 19, Cleveland, 3 minutes 27 seconds.
5. George Jarrett, 16, Dayton, Ohio, 3 minutes 10.2 seconds.
6. Harold Mitchell, 18, Everett, Mass., 3 minutes 02.4 seconds.
7. Chester Lanzo, 19, Cleveland, 2 minutes 54 seconds.
8. Harold R. Sinclair, 20, Chicago, 2 minutes 53.4 seconds.
9. Daniel J. Clini, 17, Springfield, Mass., 2 minutes 33 seconds.
10. Albert Courtial, 17, St. Louis, 2 minutes 32 seconds.
11. Frank Kiewicz, 17, Detroit, 2 minutes 30 seconds.
12. Robert Cahill, 19, Indianapolis, 2 minutes 16.8 seconds.
13. Russell Yungbluth, 17, St. Louis, 2 minutes 13.8 seconds.
14. Harold Schwede, 19, Lakewood, Ohio, 2 minutes 07.8 seconds.
15. Charles Thomas, 17, Buffalo, 2 minutes 03 seconds.
16. Harry Edsall, 20, Marion, Ohio, 2 minutes 02.6 seconds.
17. Garland Eickmeyer, 17, Ft. Wayne, Indiana, 2 minutes 00 seconds.
18. John Freeman, 16, Indianapolis, 1 minute 49.2 seconds.
19. Robert Huddleston, 17, Indianapolis, 1 minute 49.2 seconds.
20. Gordon S. Light, 18, Lebanon, Pa., 1 minute 46.8 seconds.
21. Donald Mertens, 14, Erie, Pa., 1 minute 44 seconds.
22. John Malloy, 20, Columbus, Ohio, 1 minute 40 seconds.
23. Dale DeBowman, 17, Columbus, Ohio, 1 minute 40 seconds.
24. Joe Hervat, 18, Kenosha, Wisconsin, 1 minute 18 seconds.
25. August Ruggeri, 18, New York City, 1 minute 17.2 seconds.

MOFFETT INTERNATIONAL CONTEST
For Outdoor Fuselage R.O.G. Models

1. Marvin Schmidt, Maplewood, Missouri, 2 minutes 42 seconds.
2. Robert Huddleston, Indianapolis, 2 minutes 28 seconds.
3. George Mackie, Chicago, 2 minutes 02 seconds.
4. Russell Yungbluth, St. Louis, 1 minute 52 seconds.
5. Ralph Kummer, St. Louis, 1 minute 45.6 seconds.
6. J. W. Kenworthy, England, 1 minute 29.4 seconds.
7. Wallace Simmers, New Lenox, Illinois, 1 minute 22.7 seconds.
8. Captain C. E. Bowden, England, 1 minute 12 seconds.
9. L. A. Wood, England, 1 minute 05 seconds.
10. S. E. Capps, England, 52.2 seconds.
11. Ernest Houslander, Hamilton, Ontario, 50.4 seconds.
12. Harry Burrows, Toronto, Ontario, 44.4 seconds.

In the Moffett Contest, Mr. B. P. Pond flew Mr. Kenworthy's model by proxy; Captain Willis C. Brown was proxy for Captain Bowden; Mr. Victor R. Fritz was proxy for Mr. Wood, and Mr. Charles H. Grant was proxy for Mr. Capps.

TEXACO CONTEST
For Gasoline Powered Models

1. Maxwell B. Bassett, 19, Philadelphia, 21 minutes 57 seconds. (New record).
2. Joseph Kovel, 19, Brooklyn, 14 minutes 02 seconds.
3. Joseph R. Braun, 18, Philadelphia, 8 minutes 26.5 seconds.
4. Robert Long, 17, Reading, Pa., 3 minutes 33 seconds.
5. Emanuel Radoff, 19, Newark, N. J., 1 minute 40 seconds.
6. Irwin Ohlsson, 20, Los Angeles, 36 seconds.
7. Harold C. Mitchell, 18, Everett, Mass., 33 seconds.

STOUT CONTEST
For Indoor Stick Models

1. Herbert Greenberg, 18, Newark, N. J., 19 minutes 04.6 seconds. (New Stout Indoor Record).
2. John S. Stokes, Jr., 13, Huntingdon Valley, Pa., 18 minutes 53.4 seconds. (New junior record).
3. Emmanuel Enderlein, 20, Philadelphia, 18 minutes 42 seconds.
4. William Sherwood, 16, Tyrone, Pa., 18 minutes 30.6 seconds.
5. Ralph Kummer, 18, St. Louis, 17 minutes 49.8 seconds.
6. Harry Burrows, 18, Toronto, Ontario, 17 minutes 14.2 seconds. (New Canadian record).
7. Robert Pekelsma, 20, Chicago, 16 minutes 52.2 seconds.
8. Robert Wilde, 17, Philadelphia, 16 minutes 17.1 seconds.
9. Bruno Marchi, 18, Medford, Mass., 16 minutes 00 seconds.
10. E. Carlton Harris, 17, Buffalo, 15 minutes 00 seconds.
11. Harold Mitchell, 18, Everett, Mass., 14 minutes 54 seconds.
12. Wilbur Tyler, 17, Everett, Mass., 14 minutes 09 seconds.
13. George Waite, 16, Philadelphia, 13 minutes 59 seconds.
14. Lawrence Smithline, 17, New York City, 13 minutes 48 seconds.
15. George Schweigart, 19, National Park, N. J., 13 minutes 23 seconds.
16. John Haw, 18, Philadelphia, 13 minutes 19.8 seconds.
17. Russell Yungbluth, 17, St. Louis, 13 minutes 14.4 seconds.
18. Joseph Kovel, 19, Brooklyn, 13 minutes 12 seconds.
19. Frank Kiewicz, 17, Detroit, 13 minutes 06 seconds.
20. Peter Andrews, 20, Philadelphia, 13 minutes 02.4 seconds.
21. William Bernstein, 18, Youngstown, Ohio, 12 minutes 45 seconds.

BLOOMINGDALE CONTEST
For Indoor Fuselage R.O.G. Models

1. Emmanuel Enderlein, 20, Philadelphia, 13 minutes 24 seconds. (World record).
2. John Young, 19, New York City, 13 minutes 15 seconds.
3. Hyman Oslick, 14, Philadelphia, 12 minutes 59.4 seconds. (New junior record).
4. Herbert Greenberg, 18, Newark, N. J., 12 minutes 23.5 seconds.
5. John S. Stokes, Jr., 13, Huntingdon Valley, Pa., 10 minutes 55.8 seconds.
6. Vernon Boehle, 19, Indianapolis, 8 minutes 52.2 seconds.
7. Ralph Kummer, 18, St. Louis, 8 minutes 45 seconds.
8. Thomas W. Donohugh, 19, National Park, N. J., 8 minutes 45 seconds.
9. Albert Courtial, 17, St. Louis, 8 minutes 12 seconds.
10. Harold Mitchell, 18, Everett, Mass., 7 minutes 43.8 seconds.
11. William Campbell, 19, Toronto, Ontario, 6 minutes 50 seconds.
12. George Waite, 16, Philadelphia, 4 minutes 42 seconds.
13. Lawrence Smithline, 17, New York City, 4 minutes 13 seconds.
14. Paul Ford, 18, Columbus, Ohio, 3 minutes 40.8 seconds.
15. Paul Englehart, 16, Pelham Manor, N. Y., 3 minutes 06.6 seconds.
16. Raymond Steinbacher, 13, Ridgefield, N. J., 3 minutes 05 seconds.
17. John Malloy, 20, Columbus, Ohio, 2 minutes 29.4 seconds.

EXHIBITION SCALE MODEL CONTEST
Heavier-Than-Air Division

1. Louis Casale, Syracuse, N. Y., Waco Taperwing, 97.8.
2. C. Nelson Black, Columbus, Ohio, Vought Corsair, 96.1.
3. Carlyle B. Linskie, Dallas, Texas, Pitcairn Autogiro, 93.
4. Earl E. Brinning, Detroit, Stinson Reliant, 92.3.
5. Thad S. McCulloch, Crawfordsville, Indiana, Boeing P-12-C, 91.4.
6. Kenneth Diget, Battle Creek, Mich., Monocoupe, 91.
7. Kenneth Bonesteel, Cuyahoga Falls, Ohio, Curtiss F 11 C-2, 87.1.
8. Earl F. Maxwell, Cuyahoga Falls, Ohio, Puss Moth, 86.9.
9. Branson L. St. John, Winnipeg, Canada, CF-10L, 86.6.
10. Joseph F. Seidenwand, Cleveland, Spad XIII Cl, 84.5.
11. Max Sokol, Hamtramck, Michigan, 84.
12. Harmon W. Thomas, Bradford, Pa., Waco C, 82.
13. Michael Holly, Chicago, Boeing P-12-B, 81.5.
14. Jack Herget, Akron, Boeing F4B3, 80.5.
15. Fred Mayfield, Jr., Akron, Bird Biplane, 79.2.
16. John Holly, Chicago, Stinson Detroiter, 77.7.
17. Dale DeBowman, Columbus, Boeing F4B4, 77.5.
18. Fred McClure, Akron, Curtiss P6E, 77.4.
19. Ralph Grimming, Northfield, Ohio, three models, honorable mention.

Lighter-Than-Air Division

1. Mike Kostich, Akron, U.S.S. MACON, 96.
2. Max Lubchuk, New York City.
3. August Ruggeri, New York City.

OPEN CLASS CONTESTS FOR CONTESTANTS 21 AND OVER

INDOOR STICK MODEL CONTEST
(Springfield Trophy)

1. Carl Goldberg, Madison, Wisconsin, 22 minutes 59.4 seconds. (New world record).
2. Ernest A. Walen, Springfield, Mass., 15 minutes 20.4 seconds.
3. Donald Lockwood, Chicago, 14 minutes 34.2 seconds.
4. William Atwood, Riverside, California, 12 minutes 51 seconds.
5. Jesse Bieberman, Philadelphia, 12 minutes 30 seconds.
6. Frank Zaic, New York City, 11 minutes 54 seconds.

INDOOR FUSELAGE MODEL CONTEST
(Akron Trophy)

1. Jesse Bieberman, Philadelphia, 6 minutes 31.2 seconds.

OUTDOOR STICK MODEL CONTEST
(Balfour Trophy)

1. William Atwood, Riverside, California, 1 minute 30 seconds.
2. Frank Zaic, New York City, 1 minute 27 seconds.
3. Ernest A. Walen, Springfield, Mass., 1 minute 03 seconds.
4. Donald Lockwood, Chicago, 1 minute 00 seconds.
5. Louis Rein, Mansfield, Ohio, 51 seconds.

OUTDOOR FUSELAGE MODEL CONTEST
(Akron Trophy)

1. William Atwood, Riverside, California, 2 minutes 27 seconds.
2. Frank Zaic, New York City, 58.2 seconds
3. Carl Goldberg, Madison, Wisconsin, 55.2 seconds.

GASOLINE MODEL CONTEST
(Comet Trophy)

1. Carl V. Carlson, Chicago, 6 minutes 48.5 seconds.

Here Is the Junior Record Baby R.O.G.

Data and Plans Which Will Enable You to Build a Winning Model

By VICTOR R. FRITZ
Field Director, P.M.A.A.

THIS ship was designed and built by Hyman Oslick, 14 years old, who lives at 2644 South Darien Street, Philadelphia, Pa. He is a member of the Condor Chapter of the Philadelphia Model Airplane Association.

On March 17th, 1934, at the sixth indoor P.M.A.A. meet, he flew this ship for 9 minutes, 11 seconds, establishing a new N.A.A. record, Junior class "A" R.O.G. A glance at the official national records will show you that this is not Hyman Oslick's first N.A.A. record. Here it is for you to build.

Bill of Material

All measurements are in inches. All material balsa wood unless otherwise specified.

FUSELAGE—

1 motor stick 1/64x7/16 ends 9/16 center x 8-1/16.
1 nose cap 1/64x1/8x1/4.
1 tail cap 1/64x1/8x3/16.

EMPENNAGE—

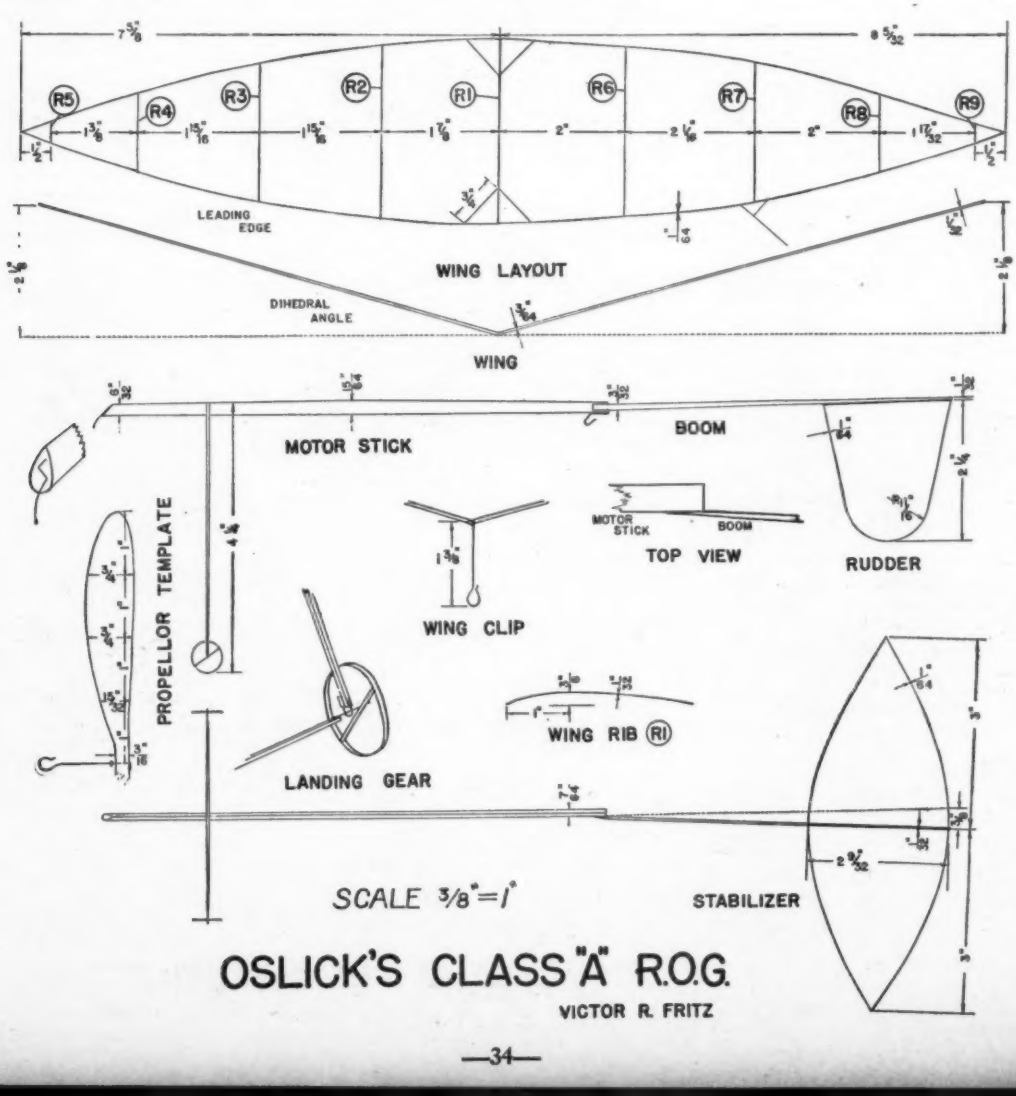
1 tail boom 1/32x3/32 tapered to 1/32x1/32x5-1/2.
2 stabilizer spars 1/64x1/32x6-1/2.
1 rudder outline 1/64x1/32x5-3/8.
1 rudder rib 1/64x1/32x2.
1 rudder brace 1/64x1/64x1.

LANDING GEAR—

2 struts 3/64x1/32 at top tapered to 3/128x1/32 at bottom x 4-1/4.
2 bearing supports 1/64x1/32x3/32.
2 thread bearings 3/16 inches long.
1 axle center 1/64 square x 2-7/8.
2 bamboo axle ends 1/100 square x 1/4.
2 wheels — 2 celluloid rims 1/32x1-3/4.
2 spokes 1/64 square x 1/2.

WING—

2 left spars 1/64x3/64 tapered to 1/64x1/32x8-1/4.
2 right spars 1/64x3/64 tapered to 1/64x1/32x7-7/8.
9 ribs all 1/64x1/32 x length. They are as follows:
2—R1 = 2-31/32, 1—R2 = 2-25/32, R3 = 2-7/32, R4 = 1-9/32, R5 = 11/32, R6 = 2-23/32, R7 = 2-1/4, R8 = 1-14, R9 = 9/32.
4 wing braces 1/64x1/64x3/4 (placed at 45 degrees).
1 horn 1/64x1/64x1. (Assists keeping ship off light fixtures).
1 horn brace 1/64x1/64x5/16.



METAL FITTINGS—
Propeller shaft, "S" hook, rear hook and wing clips .010 music wire.
Thrust bearing .014 music wire.
Propeller block 19/32x31/32x8.
Bearing—one glass bead.
Rubber motor—1 loop 1/30x1/32x19.
Cement, microfilm and rubber cement.
Incidence 1/16 inch. See drawing rear wing clip.
Weight .0161 oz.

The model at the present time is a part of the P.M.A.A. exhibit in the Aviation Section of the world famous "Franklin Institute" in Philadelphia, Pennsylvania.

Curtiss Pursuit U. S. Army Air Corps PW-8

(Continued from page 26)

plane was first designed in 1922. This plane may be considered the forerunner of the modern pursuit equipment possessed by the Army Air Corps of the present day. As a matter of fact this plane could hold its own with subsequent improved pursuit planes on a basis of the same wing and power loading.

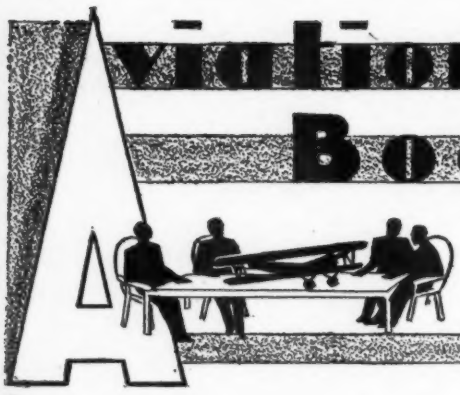
These planes were originally assigned to the 94th Squadron of the First Pursuit Group and made a trans-continental formation flight, nearly two squadrons of them, across the United States to Crissy Field, San Francisco. This flight was one of the early group flights ever successfully accomplished with military planes at that time.

The plane carries 200 rounds of 50 calibre ammunition and 600 rounds of 30 calibre ammunition. The gas tank is crash-proof. The horizontal stabilizer is adjustable and night flying equipment is standard. The wings are covered with plywood with multiple spars and ribs. This type decreases the damage from gunfire. The wing radiators are of brass and were the only thing that did not bear up well under service requirements. The large area exposed to gunfire and leakage heralded the advent of the tunnel radiator with its better cooling ability and less area of vulnerability to gunfire. This feature was incorporated in subsequent modifications of the PW-8 and finally terminating the development in the Curtiss Hawk P-1. The landing gear was of unusual design, in that the axle was done away with and the wheels carried on steel streamlined tripods and sprung with rubber discs in compression. This was new and novel.

The engine was either the low compression D-12 or the high compression model of 460 h. p. Another feature was the means of bringing the oil up to operating temperature quickly, thus enabling quick take off and less warming up. It is well to note that this plane was exceptionally well streamlined.

At the time of its inception, this aircraft was of vastly better design than European contemporaries and aerodynamically gave the Army Air Corps a marked superiority. Unfortunately, this lead has not been kept. The PW-8 was initially developed by the Curtiss Company at their own expense and submitted to trial by the U. S. Government, which promptly accepted this plane.

Aviation Advisory Board



Conducted by
CHARLES HAMPSON GRANT
Chairman of the Board
Formerly of
The Technical Section, Air Service, U. S. Army

MANY of the questions that we have to answer this month show that our model building friends are developing original lines of thought.

Walter Brewer Jr., of Framingham, Mass., R. F. D. 2, has been thinking about building an autogiro powered with a gasoline engine. That is quite an idea and we have never heard of it being done before. The questions which he asks have no precedent and cannot be answered accurately and positively unless someone has built such a ship. However, we can give Brewer approximate answers which will probably help him to start his work. After a little experimentation he will be able to know exactly what should be done. The questions are as follows:

Question: Do you think it would be advisable to make an autogiro model powered with a gas motor?

Answer: Yes, we believe it would be possible providing the span of the rotor were at least ten feet.

Question: If possible what would be the total vane area of such a model?

Answer: Each vane should have about two square feet. There should be three or four vanes.

Question: Should the vanes be set at a positive or negative angle?

Answer: In the regular full size autogiro, the vanes are set at an angle which is slightly positive to the plane of rotation and 5° to 10° positive to the direction of flight when the vane is in a position parallel to the lateral axis and traveling forward. In a model it has been necessary to give the vanes a negative angle to the plane of rotation in order that they would revolve. The cause of this is mainly the fact that the airfoil section is so inefficient that a large negative angle to the plane of rotation is necessary to cause a driving force for the rotor. If your airfoil sections of the vanes are made carefully, you should be able to use zero angle or a very small negative angle; this negative angle being figured from the plane of rotation.

It will be interesting indeed, to know how Brewer progresses with his experiments and we hope that he will keep us informed regarding them.

Some more questions come from John Cairney of 602 Belgrove Drive, Arlington, New Jersey. He has been having quite a little trouble doping the wooden surfaces of models. He says that the dope does not cover the surfaces as it should. It covers some places of wood and leaves other places almost entirely bare. What is the cause of this and how can it be corrected?

Answer: The cause of this is that the wood is porous in some places and not in others. Where it is porous, the dope sinks into the wood and does not cover it. The best method to use in sizing wooden surfaces, especially that of balsa, is to use a thin solution of hot glue, as follows:

Get the regular granular glue, mix it with a little water and let it come to a boil, stirring it and making sure it is thoroughly mixed while heating. The solution should be quite thin so that it drops readily from a stick or spoon. It should not thread or gum. When it is ready, apply the glue to the surface with a brush, allowing the surplus glue to be wiped off by the brush stroke. When this is done, set aside until it is thoroughly dried. Then sand it very lightly with fine sandpaper, merely smoothing the surface without sanding away the glue itself. When varnish or lacquer is applied to wood treated in this manner, it will give a very fine glossy surface.

Question: How is it possible to bend a metal tube around the nose of an airplane without denting it?

Answer: The best system we know is to fill the tube with solder first. Let the melted solder fill the tube completely and then bend the tube around some instrument of the proper radius or form. After this is completed, melt out the solder.

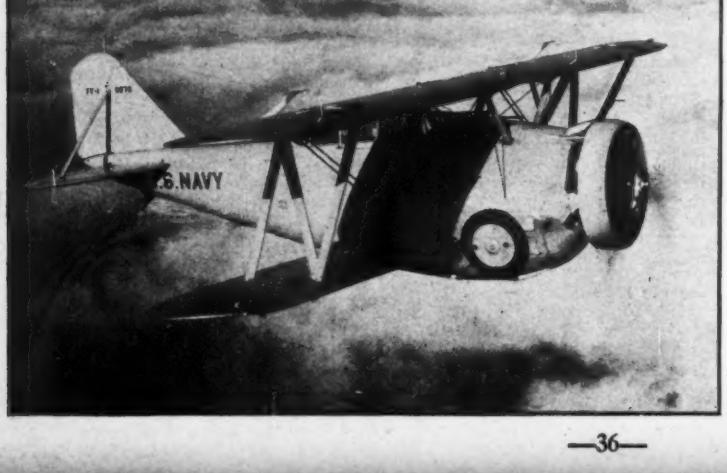
We have some questions from Harleth G. Wiley of Crozet, Virginia. His first question would appear to belong to the cloak and suit industry. However, we believe he must be speaking aeronautically in asking these questions.

Question: What are the advantages of "half pants"?

Answer: "Half pants" streamline the wheel to a reasonable degree and yet allow the wheel to be taken off when it is necessary to service it.

Question: What is the best position of the wing on a speed plane?

Answer: Insomuch as the word "position" means the location of one thing relative to another, we cannot tell exactly what



Here is a picture of the Navy's latest mystery fighter, the FF-1. The plane is said to be the very last word in fighting equipment; a two-place job with a metal monocoque fuselage and wings of fabric over a metal structure. The tail assembly is all metal. The landing gear is drawn up into a special recess in the fuselage during flight. The cockpits for pilot and gunner are placed in tandem and are covered by a transparent, streamlined "coupe" top. While all performance data on the ship is regarded as a secret of war, it is reliably reported to have a speed of 215 miles per hour. Power is furnished by a Wright *Cyclone* engine of 600 horsepower with a Townend low drag ring. Probably the most complete radio equipment ever carried aboard a fighting plane is installed. Note the antenna extending from the tail to each wing tip.

The first squadron of these ships went into active service on June 15th, with VS squadron 3B, based aboard the *U.S.S. Lexington*.

Wiley means from this question. Does he mean position relative to the center of gravity, position relative to the tail, a high-wing, a low-wing, or just what does he mean? We would like to be able to answer this question intelligently, but refrain from doing it until further details regarding his exact meaning are available. We suggest he write to us and explain what he has in mind.

Question: Why did not Jimmy Wedell's plane have a retractable landing gear?

Answer: Evidently Jimmy Wedell felt that the type which he built would be speedier than one commonly designed with thick wings; for you know, Wedell's plane has very thin wings; the airfoil section being similar to a flat elongated streamline. In thin wings it is impossible to enclose within the wings, the landing gear when it is retracted. Most of the retractable landing gears of low-wing monoplanes are drawn up into the wings, as you know. The only other alternative would be to draw the wheels into the body. However, this usually requires that the cross section be enlarged to house the wheels properly. This causes added resistance. Probably Wedell figured that the advantage of greater speed obtained from using thin wings would greatly offset the disadvantage of a well streamlined landing gear.

Question: What is a double banked radial motor?

Answer: It is a radial motor with two sets of cyclinders, each set radiating out from the hub or crankcase like the spokes of a wheel from the hub; one set, however, being behind the other. The cylinder in the rear set is not placed directly behind the cylinder in the front set. It is slightly staggered. That is, the cylinders in the rear set are directly behind the space between each cylinder in the front set. This allows proper cooling. Commander Hawks' Northrop Gamma was equipped with this type of engine.

Question: Is there an air-cooled "in line" motor?

Answer: Yes, there are a number made in this country and in England. The Fairchild "22" parasol uses an inverted "in line" engine.

Question: Why not use an "in line" engine on the fastest speed plane instead of a liquid-cooled one?

Answer: So far air-cooled engines of large horse-power have not been made. The air-cooled engine at present usually runs in horse-power from ninety to two hundred fifty. The reason for this is that it has been very difficult to cool an extremely high powered in line engine with air alone.

Question: What does the abbreviation S.P.A.D. wartime fighter mean?

Answer: This question has been answered before. However, these initials, which are commonly pronounced "Spad", stand for the name of a French society; Societe Pour Aviation et ses Derives. This society was an outgrowth of the old Deperdussin firm, founded in 1910 and revived in the first year of the war by a company, at the head of which was M. Bleriot.

Question: What is the best plane of the Army Air Corps, considering dependability, range, speed, etc.? Of the Navy?

Answer: There are so many standpoints of performance in determining accurately the best plane from this standpoint, that at best it would be a mere guess or opinion. In the Army, we believe the Curtiss Hawk is the best one from this standpoint and in the Navy, the Vought Corsair would fill this position.

Question: What is the best type of flying model; parasol, monoplane, mid-wing, low-wing or biplane?

Answer: It is impossible to answer this question positively, for some parasol, mid-wing and other types are very unstable and others are stable. The whole crux of the matter is that the type depends upon the position of the wing relative to the body. While flying qualities of a model are not regulated in the same manner, the flight quality is dependent upon the position of the wing relative to the line of thrust and center of gravity. In building a model which has the center of gravity well below the wing and the line of thrust well above the center of gravity, you will have an exceptionally fine flying model with unusual stability. Many parasol models from this standpoint, are unstable as the center of gravity usually is above the line of thrust. In mid-wing monoplanes, the center of gravity, line of thrust and the wing are often coincident. Such a model does not have great stability, unless it is attained in some other manner. However, if you build a model with the line of thrust high and then equip it with fairly heavy wheels you will find that it satisfies the above mentioned condition which gives stability. That is, the heavy wheels lower the center of gravity below the line of thrust and the wing.

Next month we will answer a few more of the questions which have come into the office. If you have something which is puzzling you, we will do our best to help you. Until then, happy landings!

Illustrated Aviation Dictionary

(Continued from page 27)

term is used in reference to more serious accidents than usually result from a crack-up.

81. **DEAD-LINE.** The line, actual or imaginary, on an airdrome from which airplanes start for their take-off. Also the line where the pilot must cease handling the airplane under its own power. "Never run your motor past the dead-line."

82. **DECALAGE.** The angle between the wing chords of a biplane or multiplane. In a monoplane, the angle between the chord of the main wings and the chord of the stabilizers, with the elevators at neutral.

83. **DIHEDRAL ANGLE.** See *angle, dihedral.*

84. **DIVE.** A' steep descent, with or without the aid of the motor, in which the speed of the airplane is greater than its maximum speed in horizontal flight.

Write and tell us if you like this feature of our magazine.

Air Ways—Here and There

(Continued from page 25)

CLUB NEWS

Columbus Model News

Though we have not heard from the model builders of Columbus, Ohio, for some time, it appears that they have been active. Picture No. 7 shows one of their latest ships, a six foot S.E.5 model, with its builders, Robert File of 502 Seymour Avenue, left, and James Kilbourne, of 156 South Drexel Avenue. It was flown at the Boy Scouts Circus at Columbus, which was held last Spring. This demonstration is put on annually at the Ohio State Fair Coliseum. The models which were entered ranged from miniature R.O.G. to the six foot model shown.

Hartford Aero Model Club

The Hartford Aero Model Club believe in extremes, as is shown by picture No. 8. The large model is a Stinson trimotor with a wing span of nine feet. This ship was built by four members of the club. The frame is constructed completely of balsa wood and covered with bamboo fiber tissue. The small model is a Vought Corsair which has a wing spread of twenty-five and one-quarter inches. This ship was built by Carl J. Scherer and it is an exceptionally good flyer, having made a duration on several occasions, of one minute. Every year in June, the Connecticut Model Airplane Meet is held at the State Armory in Hartford. Outdoor events are held at Brainard Field. The Hartford Club is particularly active in promoting this Contest.

Hanger 13

A very active model club is located at Beloit, Wisconsin. Its club leader, Conrad Hansen, Junior, sends us picture No. 9, showing a group of its members. Recently a hobby show was held in this town. They put on a very excellent model airplane exhibit which consisted of a complete layout of an airport. All details were carried out and miniature ships gave it an exceedingly realistic effect. As an added feature, the club members demonstrated the art of model building to novices. Hansen writes, "The people were kept busy at the show, stretching necks in order to follow the models in exhibition flights. Then too, the small mosquito airplanes put up in match boxes sold like hot cakes. Often a visitor was surprised by a small plane with less than six inches wing span which happened to flit by his face on its trial flight." We might add that such an instance is very dangerous for the airplane, for if the particular visitor happened to come from Jersey, upon being startled in this manner he might inadvertently think that he was being attacked by one of those long legged Jersey mosquitoes and do considerable damage to someone's "brain child."

Picture No. 9 which is shown here, was taken immediately after the show closed. Those who appear in the picture are as follows: Front row left to right, Edward Wilson, Arthur Dennie, Assistant Club Commander, Alfred Heim, Secretary Treasurer, William Bates, Club Commander, Donald Pierce, William Dennie and Stewart Martin. Standing left to right: Wilfred Treder, Mr. R. E. Southers, Boy's Secretary of the Y.M.C.A., Edward Howard, Burton Booth, William Gahagan, Conrad Hansen Jr., Club advisor or leader, Elwin Lindsley, William Stowell and Frank Ross Jr., assistant leader.

All told, the club has a membership of thirty-three boys, ranging from eleven to twenty years of age. Two leaders are appointed for the club by the Y.M.C.A., Boys Department. However, the club's officers are elected from the club membership semi-annually.

The unique dirigible shown in the foreground is being constructed by Wilfred Treder. This Club also engages in social activities as well as model airplane building. They feel that this is quite an attraction for their members. Suppers, swimming, outings, etc., are held now and then. This is what we call a real progressive model airplane club and UNIVERSAL MODEL AIRPLANE NEWS wishes them the best of luck and future success.

Milwaukee Model Engineers

We again hear from some long lost friends, the Model Aircraft Engineers of Milwaukee. John G. Zimmerman writes and tells us that his silence has not been due to inactiveness but rather to overactiveness. They have been engaged in a great number of hobby shows, exhibits and contests. One of the things for which the club should be commended is the winning of the Popular Mechanics award for the most popular exhibit at the Y.M.C.A. Hobby Show held last winter. He says that some of the older fellows are building gasoline driven jobs; the results obtained are being kept secret for the present time. Zimmerman must be trying to get some of you other gas job fans excited. However, I am sure that you will try to match him with as fine a job as he infers that he has. He even threatens in his letter, that the design of the model incorporates the theories which your editor embodies in his articles, Aerodynamic Design of the Model Plane. This sort of puts him on the spot.

Picture No. 10 shows a very beautiful Travelair Speedwing which was built for the Curtiss Wright Travelair Contest, held by the club at the Milwaukee Airport. It is a beautiful looking job. From Zimmerman's letter, we infer that this ship is a flying scale model and performs beautifully. Twenty ships of this type were flown at the Contest.

Youngstown Model Airplane Club

Persistence has its reward. Sometime ago Mr. William Bernstein of 619 Market Street, Youngstown, Ohio, wrote to our Air Ways Department, asking for some help in forming a model club. He says that after a few unsuccessful attempts, he finally has a very active club going. The club was formed by establishing a supply depot; boys then naturally gravitated to this place and were signed up. Rather a clever way to go about it, eh, what? Any young men living in or near the vicinity of Youngstown are cordially invited to join the club. Simply write Mr. Bernstein. Picture No. 11 shows a group of club members.

The Zip National Model Contest

After many delays, the judging of the winners of the Zip National Model Contest has been completed. At the present time we are lacking complete information concerning it. However, we do know that Raymond A. Norden of Astoria, New York, is the first prize winner; Aurelio Cerdan of Rockville Center, New York, won fourth prize; John J. Fallon of Floral Park, New York, won fifth prize; and J. H. Hutchinson of Hempstead, New York, won sixth place. A group of judges and some of the winners will appear in next month's issue.

Empire Model Airplane Club

Elmhurst, L. I., has a model club called the Empire Model Airplane Club. It is not large, but quite active and certainly deserves mention in our columns, for any club which is organized is a boost to aviation and a great help in the education of young men for their future life's work.

Sharon Model Aero Club

In Sharon, Pa., there is a model airplane club of 150 members. Recently their second model airplane contest was held at Buhl Farm. This was sponsored by the Club and the Sharon Herald. Sixty members entered models. Fourteen prizes were given, which consisted of eight model airplane kits, a silver cup, a medal and some very useful tools. During the contest, two stick models of the "B" Class passed out of sight directly overhead. One of them was in the air over fifteen minutes and the other thirteen minutes before being l

to sight. Gene Kepler, who was the builder of the two models, won first place in this event. Second place was won by Bill Thiess with a flight of one minute, seven and one-half seconds. Fuselage and scale events were also held. We are indebted to Thomas B. Randolf of 819 Linden Street, Sharon, Pa., for this information.

MODEL NEWS FROM OTHER COUNTRIES

Model Flying Club of Australia

From the other side of the world we have some more news of the very active group of Australian model builders. Mr. Ivor Freshman, who is General Secretary of the Model Flying Club of Australia, never forgets to send a wad of material concerning their activities. This month picture No. 12 is one of those received from him. It shows a group of indoor model builders who recently staged a show in the Sydney Town Hall. Right to left, they are: Jack Finneran, D. Pattinson, E. G. Leighton, Don Marrett, L. Annesley, B. Eaton, Russell Jackson and Mr. Freshman. It is interesting to note that Australian boys have not acquired the microfilm habit as yet. In this country microfilm is practical universal; paper covering being a thing of the past on indoor ships.

Picture No. 13 shows a group who recently participated in the Contest held at Victoria Park, Queensland. It was won by Jack Lowther. The fellow holding the big machine is Mr. K. Wilson, who built this job for the Wakefield Trophy. It has a span of six feet, six inches.

The Model Flying Club of Australia certainly deserves a lot of credit for they have held contests consistently and regularly over a period of the last two years. Everything possible is being done to stimulate this art among the Australian boys. Knowing the "inside story," we wish to congratulate Mr. Ivor Freshman and wish him the greatest success in the future with his undertakings. We are sure many of the boys in this country, familiar with his work, join us in this. He has struggled against great odds in trying to hold the model builders together in Australia, their being several groups and cliques who appear not to wish to unify their activities. From experience in this country, we suggest that all Australian groups get together as soon as possible, for only in this way can progress be made.

Picture No. 14 shows two extreme samples of models built by Mr. E. Howell of Gore Hill, New South Wales. Mr. Howell goes in for fairly big models and has done some fine work.

Mr. Fred Steven of the Launceston Albatross Squadron of the Model Flying Club of Australia sends us considerable information. He tells us his group was started about twelve months ago and in this one year, the group has reached quite an advanced stage in regard to model performances. He sends us several pictures which we are unable to print this month. However, readers may look forward to seeing them in the columns of a future issue.

France

This month we have a great surprise for you. For the first time in the history of Air Ways columns, we hear from France. M. Pierre Legros of 47 Rue des Tournelles, Paris 3, France, sends us this information. He is secretary of the Escadre De La Rose Des Vents, which is the first model airplane club to be formed in France. It was formed in February 1933 by a group of young men who were extremely interested in model aviation and who wished to use this medium as a means of experiment. The first contest was held on the last Sunday of February on the field at Issy-Les Moulindan. Thirty-two members were present.

Picture No. 15 shows a group of some of the members of the club who were present. General Vuillemin of the Bombardment Group of Aviation was elected Honorary President and Rene Couzinet was elected Honorary Vice-President. The club is particularly interested in the development of small models with long duration. We certainly wish this first club all the luck in the world and trust that their spirit and activity in model aviation will spread throughout France.

ENGLAND

International Competition for the Wakefield Cup

The Wakefield Competition was held at Warwick, England, June 24th with entries from Great Britain, France and the United States. Several models were en route from Australia but did not arrive in time for the contest. The American team numbered the full allowance of six members. France had three entries. There were 46 British contestants in the elimination trials, held to determine the six who would compete in the finals.

The competition was held under unfavorable weather conditions, rain falling during much of the flying. This accounts for the rather indifferent flight time made by the models.

England placed first and second, J. B. Allman and R. T. Howse finishing in that order. Frank Zaic of New York City finished third. The models were permitted to

Allman, lower center, Wakefield International Competition Winner

take three flights and the time of the three flights was averaged. One American entry, that of Walter Getsla, made only one flight, an excellent one of 116 seconds. On the next attempt, the model's gears were stripped in winding the rubber motor.

Gordon Light's model, one that America was counting on hopefully, had a fatal mishap, crashing on a trial flight and snapping in two parts through the fuselage.

The final results:

		Seconds
1.	J. B. Allman, England	111.8
2.	R. T. Howse, England	90.3
3.	Frank Zaic, U.S.A	85.2
4.	A. H. Liggitt, England	76.9
5.	W. Fillingham, England	70.2
6.	R. A. White, England	61.3
7.	T. H. Ives, England	54.9
8.	Albert Howell, U.S.A.	53.5
9.	Alton H. DuFlon, Jr., U.S.A.	40.1
10.	Walter Getsla, U.S.A.	38.7
11.	Genay, France	31.8
12.	Leslie Adams, U.S.A.	24.3
13.	Desnoes, France	4.3
14.	Guillemard, France	(Wing trouble)

Correspondents

We have had a very urgent request from Robert C. Hare of 458 South Van Ness Avenue, Los Angeles, Cal., asking that we print a notice to the effect that he is very anxious that Raymond Lamb, a friend of his, get in touch with him at once. If Mr. Lamb sees this notice will he please do so.

The following readers would like others to correspond with them:

Jack Dettis, 54 Bellanca Avenue, Pittsburgh 10, Pa.

Warren Snow, 16850 Plummer Street, San Fernando, Calif.

Orval Lloyd, 317 Templeton Bldg., Salt Lake City, Utah.

Henry W. Schab, 1013 Brunswick Avenue, Trenton, N. J.

Alan D. Brown, 41 Middleton Street, Stanmore, New South Wales, Australia.

Roger Perrault, Lyndonville, Vt.

National Airmail Club, 3861 Jefferson Street, Gary, Ind.

Miss Lucyle Godwin, c/o Monroe Recreation Dept., Monroe, La.

Fred Steven, 243 St. John St., Launceston, Tasmania, Australia.

Max McCullar, Kleberg County, Kingsville, Tex.

Harleth G. Wiley, Crozet, Va.

Dick Cudaback, 735 Jackson Road, Florence, Ala.

The Development of the Fokker Fighters

(Continued from page 9)

Fokker's next move was to design the Fokker triplane, perhaps the most maneuverable airplane built for all time. With the design came several other moves. Greatest of these was Fokker's purchase of the controlling interest in the Oberursel motor company which amounted to 4,000,000 marks. The last move was prompted by the fear that motor builders entering the airplane industry, as did Mercedes and B.M.W., might refuse to supply motors to competitors. At the same time the Fokker triplane used the Oberursel Rotary and to be denied these would have meant ruin.

More thought was given the triplane than any other plane designed by Fokker. Knowing that victory or defeat would be decided in a few short minutes when the enemies met in combat, Fokker sacrificed speed for the essential climb and maneuverability. The triplane combination was chosen because it provided maximum area in minimum span, and a short span meant a short body, and a short body leans toward quickness in turns.

Begun in 1916, the design of the Fokker Dr. I (Dr. I was the abbreviation for Dreidecker 1), was not completed until sometime later, and the first Fokker triplane appeared in the middle of 1917. Figure 3 shows the first triplane as it came out of the shops. Again Fokker tried to offer the officials a plane without visible bracing in the wings, but they refused to consider his offer.

Craftily, Fokker returned his plane to the shops for a short time and made some changes, alterations that could be seen. This time the triplane appeared as in Figure 4, with struts. This time the officials bit and bit hard. "This plane will stand up," they thought. "It has struts to support the wings." It was Fokker's turn to laugh. The struts, as they called them, were nothing but ties, "visible means of support," of streamlined spruce

hardly an inch thick. If the aid of these pseudo-struts was actually to structural advantage, this would have been only a small factor. However, the mental impression put forth by this arrangement gained the favor of scores of front pilots who trusted their lives in the triplane.

Fokker is accused of having copied the Sopwith triplane, but by comparing the plans of the Dr. I printed in the October 1931 issue with drawings of the English machine, there is no similarity or repetition of design except in the shape of the struts, which on the Sopwith were necessary, and on the Fokker were optional.

It is from the standpoint of constructional design that the Fokker Dr. I is most interesting. Although the wing spar appeared as a single spar, that member is in reality two spars closely situated and joined by a top and bottom plate of three-ply veneer. Twenty-two ribs are used in the upper plane, 20 in the middle plane and 20 in the lower plane. From the front spar of each plane to the leading edge, the upper surface is stiffened with plywood. Fully loaded, the safety factor of the Fokker is in the neighborhood of 5 to 1.

Ailerons were fitted in the upper wing only and carried balances as was Fokker's policy at that time. The center section is the only point in the cellule where wire bracing is used externally. Center section struts were welded steel tubes with their extremities joined to the upper longerons.

In the tail unit of the Dr. I, the rudder is the Fokker comma type already familiar to readers. One pivot-spar and two ribs of streamlined section were outlined with steel tubing.

The horizontal tail plane is again cantilever in construction and its framework is such as that used on a normally wire braced assembly of that time. The stabilizer is triangular in shape and the elevator is of the one piece balanced type with cut-out for the rudder.

In broad lines, the fuselage structure is the same as employed on previous Fokker fighters. The four main longerons were ¾ inch diameter steel tubes while uprights and cross members were ⅝ inch diameter steel tubes. The standard wiring attachments consist of a short length of small tubing bent in the form of a semi-circle and welded to the corners of the longeron and upright joints. Bracing wires are looped around these fittings forming a loop and functioning as a single wire of double strength. A large recess the size of the wing spar is left open in the bottom of the fuselage for the attachment of the lower plane.

A regular steel tubing landing gear of the wire braced type is set far forward on the fuselage. The wing axle contains two spars of aluminum tubing each 2¾ inches in diameter. The axle wing is covered with 3/16 inch thick three-ply veneer.

A tail skid of the rubber spring type is fitted in the rear of the body. Wing skids made of ash were attached to the lower wings directly under the wing struts, but their value in a bad landing would be rather doubtful.

The engine used in the Fokker Dr. I was the 110 h.p. Oberursel rotary fitted with a Bosch magneto and a German copy of the French Tampier bloc-tube carbureter. Tanks were provided for 15 gallons of fuel and 4 gallons of oil.

Authentic and truthful information regarding the performance of the Fokker triplane, like other performance figures issued by manufacturers, is often exaggerated for the sake of impression. However, the information given here has been compiled from official figures, and from accounts of men who flew the Dr. I, and since they agree with one another, can be regarded as correct.

Designed for fighting rather than speed, the Fokker Dr. I was a powerful weapon in the hands of a clever pilot. In a triplane of this type, Voss scored 22 victories in three weeks, an average of one a day. While most of von Richthofen's victims were two-seaters, it is interesting to note that his last twenty, gained on a Fokker Dr. I, were all one-seaters except seven, and of these, three were Bristol Fighters, more deadly than a single seater. It would seem then, that in spite of present day assertions that the Fokker Triplane was a poor machine, Richthofen with his good judgment and ability would not choose to run into S E. 5 and Bristol ships if he wasn't sure they were inferior to his own machine.

Though the Triplane's speed varied between 110 and 115 miles per hour, its three decks did not give it an abnormally high alighting speed. In fact, Udet's account of a fight in which Richthofen was forced to land with a shattered propeller, recalls that the Red Baron set his plane down in a patch of ground 20 meters square, and when the damage was repaired took off from the same area! Lt. Rudolph Stark, in his book "Wings of War," describes his first flight in the Fokker Dr. I " . . . they are extremely sensitive to the controls and rise up in the air like a lift. You climb a few hundred metres in the twinkling of a second and can then go round and round one spot like a top."

Below is a list of data taken from an actual Fokker Triplane:

Plane: Fokker Triplane.
Maker No. 1856.
Military No. Fok. Dr. I 144/17.
Date of construction: Nov. 20, 1917.
Weights: Empty—829 lbs., Useful load—430 lbs., Total load—1,259 lbs.
Dimensions: Wing span: upper—23′ 6″, middle—20′ 4″, lower 18′ 6″, Length over all—19′ 0″, Wing area—205 sq. ft.,Lbs. per sq. ft.—6.14, Lbs. per B. H. P.—11.15.

While the Fokker triplane was making history at the front, Anthony Fokker began to develop three new types, two of which evolved into the D. VI and D. VII.

These three types will be described and shown in part eleven of this series.

Look for the next article of this series in the October issue of Universal Model Airplane News.

The Aerodynamic Design of the Model Plane

(Continued from page 23)

The speed of rotation of a certain propeller of any airplane is dependent and proportional to the torque of the motor driving it. As a propeller is being driven, its speed increases until the sum of the *resultant* resistance of all blades balances the forces generated by the motor torque, at the points at which the resultants act. For instance, in Fig. No. 109, the forces (P) and (P′) are the resisting forces acting on the blades. The sum of these times distance (M) is always equal to the driving torque (F×M). If the force generated by the torque is measured by taking the force (F) as acting at the point on a blade where the resultant resisting force is acting, then force (F)=(P+P′), (M) being the same for all forces. Usually the resultant resisting force on a blade acts at a point 2/3 of the blade length from the axis of rotation; see Fig. No. 109.

We have now, some idea as to what Torque is and perhaps you can guess why it is of prime importance. The ability of the airplane to fly depends entirely upon the amount of propeller thrust or pull, being generated by the motor torque, provided the plan is inherently capable of flight in the first place. The more torque, the more thrust, and the torque must be great enough to create sufficient "thrust" to pull the plane at flying speed or faster.

It is all very well to have your motor develop a lot of torque, but let us note our second consideration; the amount of time that torque continues to be delivered.

If you wish your plane to remain in flight for a considerable time, it will be necessary to store up a large number of turns. For any given resistance to the turning effort of the motor, the more turns that can be stored up in it, the more revolutions at a given speed the propeller will make and the longer your plane will remain in flight. One might say, in other words, that the more *work* that can be stored up in the motor of a given airplane, the longer it will take to use up that work.

Some of our readers are going to ask; what is work? It may be defined as the capacity to exert a force through a given distance. In the case of our rubber motor, it is the capacity to exert a turning effort through a given number of revolutions. Thus, the amount of work accomplished is equal to the force exerted times the distance through which this force travels, or, W=FS, where (W) equals work, (F) equals the force and (S) the distance.

If, in a given power system, the force generated is (F), acting at the point of resultant resistance of the blade (Fig. 109), then in one revolution the work done would be (F) times the distance it traveled in one revolution. In this case it would be FX(2ΠM). Obviously now, the more revolutions that the propeller makes, the more work is done. Therefore, the total work that can be stored in a rubber motor is Fx(2ΠM)xT, where (T) equals the number of turns stored in the motor or W=F(2ΠM) T.

The rate of doing this work determines the *power* generated. This brings us to our third consideration, the coordination of the rubber motor with the propeller used on the plane. With any given propeller, a given motor will generate the same power always. If the propeller is small, it will turn fast, thus using up the work faster than it would under circumstances where the propeller was larger. Obviously then, the slower a propeller can be made to turn and yet fly the airplane, the slower the work will be used up and the less power the motor will be required to generate.

The factor which determines the power of a motor is not the size of the motor necessarily but the relation of the design of the propeller to the torque or twisting effort of the motor. This is true because the design of the propeller determines the speed at which it will rotate and use up the power stored in the motor.

These explanations may seem dry and unnecessary to some readers but it is essential that the character of these factors and their actions be clearly understood in order to understand discussions that follow, and the design of efficient motors.

Now let us consider the physical characteristics of a rubber band motor, how they determine the work that it is possible to store up in a motor and the power output when operating in conjunction with a given propeller.

When it is the object of the model builder to obtain as long flights as possible, his problem is to be able to store up a maximum amount of *work* in the motor of his plane. The amount of work that can be stored up depends on two things, the value of the torque and the number of turns it is possible to put into the motor. A formula for the amount of work that can be stored is, W=2ΠQT, where (W) = work in inch ounces, (Q) = torque in inch ounces and (T) equals the maximum of turns possible. With this formula the reader can determine the amount of work that can be stored up in any motor of a number of strands listed in the tables that are given in this article.

For instance, the work that can be stored in a motor of 8 strands of 1/8" x 1/30" brown rubber, one foot long may be determined from the table, and is as follows: W=2Π (12.0) 545, or W=41,300 inch ounces of work.

It is interesting and important to know the type of motor in which you can store the most work.

From an examination of the tables, it can be seen that the significant factors of value of a motor for any particular plane are: (1) the number of strands; (2) the number of turns it is possible to get into a motor; and (3) the quality of the rubber used. The greater the number

TORQUE TABLE – Winder Wound – Lubricated.

Stock = Brown Rubber – 1/8" x 1/30". Motor Length = 1 foot. — Motor Stretched 2 1/2 Times its Original Length

Turns →	50	100	200	300	400	500	Turns At Break	Torque At Break
8 Strands	1.60	2.50	3.10	4.30	6.60	9.00	545	12.00

Conclusions — Torque in Ounce Inches.

Max. Turns = 2 times as much as No Lubricant and No Stretch. —
" " = 1.7 " " " " With " " " " .
" Torque = 1.7 " " " " No " " " " .
" " = 1.5 " " " " With " " " " .

FATIGUE TEST TABLE

Stock = Brown Rubber 1/8 x 1/30					Stock = Black Rubber 1/8 x 1/30			
Number of Turns = 400 With Lubricant, Brown & Black Rubber								
Brown	1st Wind	2nd Wind	3rd Wind	4th Wind	1st Wind	2nd Wind	3rd Wind	4th Wind
Torque	2.25	2.10	1.95	1.82	2.10	1.90	1.80	1.75
Wound Once, Broke at 472 turns					Wound Once, Broke at 496 turns			
" 4 times, " " 508 "					" 4 times " " 524 "			
" Once, Max. Torque = 2.90 in.oz.					" Once, Max. Torq = 3.0 in.oz.			
" 4 times, " " = 3.00 in.oz.					" 4 times " " = 2.9 in.oz.			
Increase in Length = 6.8%					Increase in Length = 7.5%			
" " Possible Turns = 7.6%					" in Possible Turns = 5.7%			

of strands of any particular size and quality, the greater the torque will be.

In regard to the possible number of turns, the important factors are; (1) the size of the strands; (2) the length of the motor; (3) whether or not a lubricant is used; and (4) the quality of the rubber. The smaller the strands, the greater the number of turns that are possible. The number of turns are proportional in any particular motor, to the length of the motor. In most cases a lubricant increases the number of turns it is possible to store up in a motor. An exception appears in table number four. A small number of very fine strands of black rubber, gives more turns without a lubricant, than if a lubricant is used, as shown in table number eight. If many strands are used, the reverse is true.

A complete analysis of the tables will be given in the next issue of UNIVERSAL MODEL AIRPLANE NEWS, as well as formulas and rules from which you can make complete calcuations for any motor you may desire, so be sure to keep these tables handy for future reference.

In the meanwhile, much useful information can be gleaned from a careful study of them. Until next month,———.

How the Aeroplane Was Created

(Continued from page 15)

ver, it was directly a factor in giving the Allies supremacy in the air.

Later the famous De Havilland was designed and put into production when the United States entered the war, in 1917. This machine was designed for observation and photographic work and it was planned that high speed should be its chief characteristic. When the DeH 4 was conceived and it was decided to produce it in quantities in this country, it was found that there was no satisfactory motor with which it could be equipped, since the originals had 350-400 h.p. Rolls-Royce motors and England had her own hands full supplying equipment for the front. Therefore, American engineers decided to design such a motor which would be adaptable to production in the different automobile factories in the United States, and within less than a week, our foremost engineers had plans completed for this motor, to be known as the Liberty Motor.

Of this model DeH 4, there were constructed, three thousand one hundred and eighty-seven, all Liberty-equipped and many of which saw active service at the front as photographic and observation planes. The Handley-Page bomber, an English design, was also built in this country in limited quantities, a total of one hundred and one being shipped overseas.

Obviously, it would be impractical to completely cover here the entire ensemble of planes used in the World War so we have tried to point out the most important models and those used to the greatest advantage.

For all this activity on the part of France, England, United States and their allied nations, there was equally active work on the part of Germany. The engineers designing aeroplanes for this nation, were keenly alert to any changes or improvements on the part of their enemies. As quickly as an enemy ship was captured, they made great haste to dissect it, gather as much useful data as possible and incorporate that which looked good to them into their own ships. A good example of this was the Fokker copy of the famous Sopwith Triplane. As excellent a model as the Sopwith proved to be, the German copy was if anything even better and for a while, a squadron of these little fighters under the command of the German Red Ace, Baron Von Richthofen, caused the Allies no end of worry. Germany's greatest handicap was of course the great lack of raw material and how well they adapted themselves under this trying situation is already a matter of history and needs no repeating here. Fokker, of course was the mainstay of the German Air Force and his great difficulty was in securing motors for his ships, but once this was ironed out, he succeeded in displacing nearly all other builders to the German Government.

Foremost among German observation models were the Aviatik, Rumpler and Albatros. These companies also were placing a group of combat planes on the front, accounting for many enemy ships in hand to hand conflict.

Hansa-Brandenbourg and Gotha were constructing huge bombing ships with the idea of crossing the English channel and inflicting as much damage as possible on the city of London. In the latter part of 1918 one of these ships which was accompanied by a group of protecting pursuit ships, did succeed in making this crossing, but was brought down in flames by a daring English flyer, and Germany, convinced of the impracticability of the scheme, abandoned it. *(Continued on page 46)*

Fundamentals of Model Airplane Building

(Continued from page 8)

00 sandpaper as shown at "C." Complete the second wheel in the same manner. A center axle hole is now made through each by forcing a common pin through the center of them. Make sure that this hole is slightly larger than the wire landing gear, so as to permit it to turn easily when in place.

Assembly

All parts having been completed, the model is now ready for assembly. Cement the elevator to the underside of the motor stick. Center the elevator with its trailing edge at right angles to the stick and cement in place, as shown in the plans under "Top View." Follow this by cementing the combination rear-book and tail-skid around the end of the stick and over the underside of the elevator, as shown in the plans under "Side View."

The rudder is cemented to the left side of the stick on top of the elevator, when looking straight at the model from the front. See that its leading and trailing edges are flush with those of the elevator.

Cement the propeller bearing to the top center of the motor stick at its leading end with the bent lip of the landing gear cemented directly under it. When both are in place, silk thread is wound around them and then coated with cement for additional strength. The wheels are slipped over the turned up axles of the landing gear and their ends turned up to prevent the wheels from rolling off.

Attach the propeller shaft, as described last month, and then slip its hook through the hole of the propeller bearing. Place the wing clip around the underside of the motor stick just in front of the wing position. Place the wing with its elevation block toward the rear on the underside of the motor stick, as shown in the side view of the plans. The wing is held in place with a single rubber band. Hook one loop over one of the hooks of the wing clip. Bring the two strands of the rubber band under the wing, up and over the stick, back under the wing and hook the other loop over the second hook of the clip.

Note the position of the center of gravity, as shown in the plans under "Wing" and "Side View" and designated by the letters "C.G." Balance the model at this point under the stick and move the wing backward and forward until perfectly balanced at this point.

Four strands of 1/8" x 1/30" flat rubber are used for motive power. Measure the distance between the hook of the propeller shaft and the rear hook. Multiply this distance by four, add ½" to this total and cut a single strand this length. Tie the ends together and loop it twice between the two hooks.

Flying

This model will take off the ground without any assistance from the launcher with one row of knots wound up into the rubber motor. No pushing is necessary. Simply place it on the ground and release it. The proper way to hold the model for launching is shown in Fig. 4. Fully wound, it will jump immediately into the air. 275 turns may be put into the motor wound by hand. When stretched and wound with a winder, it may be wound to 550 turns.

Italy Solves Her Problem of Air Defense

(Continued from page 5)

shifted gears, the air-prop began to turn with a thousand horse-power behind it, and away she went—at a speed in excess of anything ever flown, for the head resistance was practically nothing at all. The catch was in the transmission between the two props; it flooded with oil, and the Italians haven't figured that one out yet).

Then there was another Caproni, an extreme flying wing type, just a tetrahedral wing, with three motors in the leading edge, no tail at all and retractable landing gear. (This bus, also, is still in the hands of the experimenters).

There have been a whole series of observation, bombing and fighting planes with W struts, an arrangement which no other nation will have at any price, but which the Italians use because they get wonderful visibility and steadiness out of them. And finally, there has been that high point of Italian technical development, the Macchi seaplane, the fastest ship in the world, with her two props one right behind the other, revolving in opposite directions—a sheer flying bullet, of which a modified form is being fitted with military equipment to see whether it won't make a pursuit ship that will stand the world on its head.

What is more surprising is to hear that the Italian motors, so little known outside their native land, are among the best in the world. Yet when one considers it, there is no motor achievement in the history of aviation more remarkable than Balbo's trans-Atlantic flight—all those planes across the Atlantic and back again through all kinds of weather and climatic conditions, without one single motor breakdown among the 48 Isotta engines that powered the 24 ships making the flight.

Yet this need not surprise those in the know for the tests imposed on Italian aviation motors are the severest they can think up and they are good at thinking up hard tests in Italy. After a new motor is built, it is run for a while and then taken apart to be examined by a commission of experts, each of whom offers criticisms and makes changes before it is reassembled. Then it goes through a gigantic wind-tunnel, like that at the Isotta factory. It has pressure and temperature controls as well as the ordinary tunnel devices. When they put a motor on the block there and set it running, all they do is bring the temperature down to 40 below zero, the pressure down to the figure an airplane would encounter at an altitude of 45,000 feet, and then hurl a gale of 400 miles an hour through that tunnel. Through quartz glass windows the commission watches the motor perform. If it fails to function perfectly for 24 hours on end under these incredible conditions, harder than any in actual service, they throw it away and build a new one.

It's the same with the planes themselves. When the trans-Atlantic flight was being prepared, one of the Savoia machines that made it was taxied across the Mediterranean all the way from Sardinia to the mainland; another one was towed through the seas off Genoa behind a destroyer doing 35 knots an hour. The tests are always just that severe—they have to be when you are dealing with so many new and untried inventions. The point is that when an Italian machine has come through the rough-housing they give it in its trials, it will stand anything.

Another result of this testing is that Italian service machines generally don't show the impressive paper performance figures that come from Hendon and Villacoublay. But the enormous speeds of French and British fighters are made under test condifions, whereas war in the air is fought out under whatever conditions you can get. One has the impression that the sturdy Italian ships will do just about as well as their more publicized rivals when it comes to a pinch.

There is another peculiarity of the Italian aviation service, a direct result of the centralized control exerted from Rome and the careful test policy. That is the extraordinary lengths to which standardization has been carried among service types. Once a new type has been passed for production, no other types of ships for the same purpose are built at all. Thus the pursuit division of the Italian air force is entirely equipped with just one type of machine—the Fiat CR30, with a 600 h.p. motor, a 34 foot span, the peculiar Italian W bracing on its biplane wings, and a rated speed of 230 miles an hour. She is an exceptionally fast climber; indeed she has to be, for Italy's land pursuit has to defend the line of the Alps over which hostile bombers possibly will be coming at great height and very fast.

Italy generally frowns on the heavy bombing type of land plane. There have

been some experiments on the type since the war and more are going on, but the mountains and the lack of good landing fields are always in the way of getting the most out of this type of machine. Italian land bombers are mostly lighter ships, two-purpose machines that can be used as observation machines.

The leading types are two Bredas and a Caproni. The Bredas are the 16, a three-seater, high-wing monoplane (in which the bracing is as near the Italian W as you can get on a monoplane), and the Breda 32, a low-wing, three-motored monoplane, reminiscent of the Douglas transports used by TWA in this country. Both are very slow as compared with their foreign rivals, the 16 rating 142 miles an hour, the 32 160 m.p.h.—but speed is not the whole story with these ships. They are both good climbers and have unusually high ceilings, and in both a good deal of speed has been sacrificed for stability and controllability. In the bumpy air conditions that reign high over the Alps and Appenines, they would probably be more than a match for similar foreign types—and it is significant that Breda 16s finished one-two in the last air transport race around Europe.

There are a good many of the Caproni ships also in service. Their latest bombing type sports a single 750 h.p. motor and has a rated speed of 152 m.p.h. Like the Breda ship, this bus is a climber and what is more, can walk over the mountains with the astonishing useful load, (for a single-motored machine) of 4400 lbs.

Among the seaplanes, everything is Savoia and Macchi. The S-55s that flew the Atlantic are the standard seaplane "bomber" type, though Italian air strategy does not contemplate using them as bombers at all, but as torpedo planes, a duty for which their double hulls fit them beautifully. Just how many of these ships Italy has in service, nobody really knows—certainly there are a lot of them. A new type, the S-66, with three pusher motors abreast, was launched recently. It is even bigger than the S-55 and will carry the new 23-inch torpedo, which is heavy enough to blow a hole in almost anything.

There is also a Savoia seaplane pursuit, a sweet little gull-winged monoplane of the flying boat type and a very fast climber, with the exceptional cruising range (for a pursuit ship) of four and a half hours. She has not been placed in production yet but is reported to be particularly handy and has already proved that she can ride out almost any kind of weather. The Macchi flying boat, the present standard seaplane pursuit ship, is somewhat slower than the Savoia job (she is rated at 162 m.p.h.) and resembles the Savoia a good deal, except in the gull-wing feature. And then, of course, there is that 423 mile-an-hour terror, which they are trying to develop into a military machine.

Behind this equipment, Italy is rapidly developing a youthful and enthusiastic corps of pilots. One of Mussolini's cardinal doctrines is that she must become a thoroughly air-minded country. The young Fascisti, the lads between twelve and eighteen years old, are sent into the mountains for three months every year on a vacation at the state's expense, and while they are there things begin to happen. Specifically, a pilot from the Italian air service happens, with the latest thing in two-seaters and a string of gliders. The youngsters get rides in the two seaters and learn to pilot the gliders. You can see for yourself that with something like a million youths getting three months' glider training every year, it isn't going to be long before there are a lot of trained pilots in Italy, to say nothing of the air-mindedness, the acquaintance with practical aviation every citizen of the country will have.

Beside which, taking a leaf out of the French book, the government has been encouraging private flying by every device it can think of, most of the devices being financial. If you are an Italian citizen and want to buy a plane in Italy, the government will loan you part of the purchase price; it will also give you free repair service at any government flying field or seaplane station, free inspection service anywhere and free gas and oil enough for 25 air hours a year, which is quite a lot of flying for a private plane. If you are one of the young Fascisti just out of a vacation glider school, all you have to do is pass a proficiency test to get a free course of training as a pilot.

Then when Italy has a few million of these young pilots riding around in Savoia torpedo planes or 423 mile-an-hour Macchi scouts, it is going to have pretty close to the best air service there is.

How the Airplane Was Created

(Continued from page 43)

To more or less offset these large bombers constructed by the enemy, France had put much thought back of the development of this type ship with the idea of concentrating a huge force of them and swarming over the enemy territory, thus forcing him into submission.

To this end also, was England building large numbers of the Handley-Page bombers and when the United States entered this program of construction, they were built to these same specifications in this country.

To offset the German submarine activity, England had a large force of seaplanes by Short, Bristol and Vickers and many built by Curtiss in the U. S. These did good work in patrolling the sea coasts and especially in guarding the fleets at Scapa Flow, Rosyth and Firth of Forth.

In the United States was the original torpedo-plane conceived by Rear Admiral Fiske of the U. S. Navy. The idea was to arrange to project the torpedo from the plane while close to the water and the aeroplanes extreme mobility, made it a very dangerous weapon to the enemy.

During the latter days of the War, France put into the field a few very interesting models in the Salmson and also Le Pere fighters. These machines were capable of high speed, rapid climb and were characterized by ability to carry a heavy load which made them valuable for long distance observation work. During these days, England was keeping pace with entirely new lines of which were the B.A.T. and DeHs. The B.A.T.s were very grotesque in appearance and bore quaint names as copies of animals which they seemed to be modeled after, but nevertheless they were very capable fliers.

Italy by this time had hit her stride and was making progress in her own right, producing the famous and well-known Ansaldo fighter, and the Societa Italiana Transarea (S.I.T.) building Bleriots. Savoia of course continued the line of Farmans built at about the outbreak of the war, but the greatest of these various ships was the Caproni. These were introduced as large biplanes for bombing and observation purposes but before the end of the struggle, there was introduced a huge triplane of gargantuan proportions in which the wing spread was more than one hundred feet.

Every war has had its outstanding heroes and this one was no exception, only that each nation had its hero or flying ace. France her Guynemer and Fonk, Bishop of England, Richthofen of Germany and of course our own Eddie Rickenbacker. But the important thing beside the individual prowess of these famous men was that the fighting ships had also to be all right.

To be sure, there were days when the equipment fell far short of the men who were to fly them, in both quality and quantity, but once these units of the service were put on a standardized basis, both virtues lacking were soon supplied and undoubtedly the final outcome in large measure, was due to the vital part played by the flying machine.

Now, compare the flying vehicle of 1919 with that of the Wright Brothers and reflect that there has passed only the short span of less than twenty years. Visualize that these machines were subjected to almost unbelievable strain, made to fly at speeds in excess of two hundred miles an hour while in steep dives to evade the enemy, and to carry heavy loads and perform in any but suitable conditions. It not only survived, but what is more, it came out of this proving ground a far better machine than could even be imagined. Without question, the evolution of the aeroplane was speeded up many times that which would have been possible under normal peace time conditions.

But after the terrible struggle was over came a new era for the flying machine and soon the nations vied with one another in adapting the aeroplane to peace time pursuits. So is witnessed the birth of the new field of transportation. Our next installment will deal with planes that were planned and built but which never appeared on the front.

Color of Airplane Often Determines Its Weight

The color of an airplane can have a very important bearing on its weight and lifting ability according to engineering officials.

Exhaustive tests by air line engineers have proved that a greater amount of paint is necessary to produce a lasting finish in a light color than if one of the darker hues is selected. On large passenger planes each additional coat of paint means many mo pounds of weight which the engines mu carry.

This was an important factor in the se lection of paint on our transport airplanes

Plane Moves 10 Feet 8 Inches at Eac Turn of Propeller

How far does a speeding airplane trave at each turn of the propeller?

On a recent flight from El Paso Pau Vance piloted an express plane in tw hours and 26 minutes, for an averag speed of 236 miles an hour.

Statisticians immediately got busy an found that Vance's plane on this flight moved forward approximately 10 feet 8 inches on every revolution of the propeller. Cruising at an engine speed of 1950 r.p.m., Vance covered approximately 20,767 feet, or 3.9 miles, per minute, it was estimated.

On the Frontiers of Aviation

(Continued from page 11)

usefulness with the result that they are to be equipped with triple the amount of planes already on hand. Sixteen new Grumman amphibians, similar to the five built for the Navy are on order for the U. S. Coast Guard as well as ten Douglas amphibians. Due to the Coast Guard's becoming of such importance as an aircraft consumer, we may see more planes expressly designed for this work.

While on the subject of Douglas amphibians, Willis Nye of California has written us that a new Douglas amphibian is being built, known as the Senior Amphibian. It will be larger than the Douglas DC-2. Pan-American Airways will be the purchaser. There had been rumors that the Army had intended to purchase one of these planes.

Willis Nye also says that a Douglas Navy fighter (225 m.p.h.), a Hornet version of the O-43, and a liquid-cooled and twin-row Boeing pursuits have also been built.

The latest news about lighter-than-air craft is that the government may soon build one or two more dirigibles like the Macon! If appropriations are obtained, the construction will begin at once at Akron, Ohio. At present the Goodyear Zeppelin Company, builders of the Akron and Macon, are building high-speed railroad trains.

To compete with the Stevens and Keppner climb into the open stratosphere (U.M.A.N., May, p. 13) in the world's largest balloon is a Belgian and a Russian team who are now making balloons for the attempt.

Some new water gliders are now being built in Germany and are to be operated from the aircraft ship, Westphalen, in mid-Atlantic. The gliders will be used in testing the air currents over the Atlantic and will alight on the water.

In this country work has gone ahead on two new Bowlus sailplanes for the Elmira meet. One is a two-place ship for Richard Du Pont; the other is a one-place job for Warren Eaton. The ships will have Zapp flaps and will be of skin-stressed duraluminum and ply-wood con-

struction. We'll see how they perform at Elmira, N. Y., this summer. Many records are sure to be broken by them. A large number of contestants are expected at the glider meet. (Du Pont has recently broken the distance record).

Since the depression no one has been buying large multi-motored planes for private use as formerly; (you may recall the large sales of Sikorsky S-38s to private interests in 1928), but encouraging news comes to us now that Lockheed has sold their first sportsman-pilot version of the Electra. This would be an excellent ship for a flier in the London-Melbourne Race.

From Mexico comes word that a new long-distance plane is being completed there. The plane has been designed by Dr. Michael Watter, noted American aeronautical engineer (co-designer of our Vought Corsairs) and will be named the Barberin-Collar. The plane will be powered by an American Pratt & Whitney Wasp with a Hamilton propeller. The ship will have a high-speed, fully loaded, of 118 m.p.h. and will have a range of 7,700 miles. A radio and blind-flying instruments will be installed. Her wing span is 55 ft.

The Aeronautical Chamber has now opened bids for the purchase of 25 sport planes to be used by its various inspectors. The planes will be of new design. Ten new Monocoupes and fifteen Kinner Play Boys are said to have been purchased by them already.

Twenty planes a month are being produced by the Fairchild company to meet the demand for their latest sport planes. The first of their amphibians is being completed for Pan-American Airways.

Stinson has also completed the first of their new tri-engined low-wing transports.

Monocoupe has produced a new De Luxe Model 90 of exceptionally clean design.

An interesting feature on the new Bellanca Senior Skyrocket is the full-cantilever landing gear, photos of which accompany this article. Its other new features are all-metal trailing edge split flaps, individualized ventilating and heating system, full N.A.C.A. type cowl, wider fuselage, indirectly lighted and shock mounted instrument panel, durable hand-rubbed lustrous finish, and oversize baggage compartment. Two of the planes have been sold already. The new ship has a high speed of 185 m.p.h., cruising speed of 159 m.p.h., climb of 1240 ft./min., service ceiling of 25,000', and a range of 910 to 1280 miles.

The first of the new Kinner four-place low-wing cabin ships will soon be ready.

Czechoslovakia has produced a new multi-purpose military plane. It carries two fixed Vickers guns, two movable Lewis guns and several bombs. High speed is 168 m.p.h.

Belgium has produced a new low-wing light plane known as the Orta-St. Hubert touring monoplane.

The latest English autogyro, C.30, has been completed, and forty-five of the ships are said to be on order! It is a three-bladed wingless 'gyro and cruises at 90 m.p.h.

A. V. Roe and Co., Ltd., has put out a new cabin biplane known as the Avro Commodore. It is quite similar to our Waco cabin ships. High speed is 130 m.p.h., cruising speed is 110 m.p.h., and landing speed is 50 m.p.h. The rate of climb at sea-level is 700 ft. per min., and its service ceiling is 11,500 feet. The power plant is a 215 h.p. Siddeley Lynx IV C. Compare this performance with the Waco's (U.M. A. N., August).

BUILD A SOLID-WOOD SCALE

Model of the General Aviation Army Observation Plane YO-27

(Plans, page 10)

Though the YO-27 is not a new ship, having been put out in the early part of 1933, it should be of interest to the model builder because of its unique design. This is one of the few twin-engined observation planes in our Air Corps, the only other outstanding one being the Douglas gull-winged, twin-engined observation plane. The YO-27 is a successor of General Aviation's first twin-engine military ship of similar design, which was probably the first multi-motored super-speed plane ever built.

The General Aviation Manufacturing Company is now busy with the development of their new tri-motor low-wing ship and when that is completed, they will probably resume their experiments with the YO-27 and similar ships, in an attempt to get some of the new U. S. Army airplane contracts.

Balsa or white pine may be used in building the model. Draw the side elevation on block of wood and cut with small jigsaw. Go over the surface with coarse sandpaper. The pilot cab will be built on later. Next draw the top elevation as shown in plans on fuselage block and cut around this outline as you did side elevation. Sandpaper the surface of the top also. Then, referring to cross-sections of fuselage on plans, shape out the rest of the fuselage with a sharp razor blade and coarse sandpaper. The cockpits may be hollowed out if desired. Cut a groove for tail wheel which will be connected by a piece of wire inserted through the wheel and bent up towards the fuselage. Its two ends should be anchored in the fuselage. Using fine sandpaper, go over the entire surface of the fuselage once more; then set it aside and begin the construction of the wing.

The wing may be made in one section and later its center section may be cut out so as to insert fuselage. Draw the outline of the wing on board of stock and cut with jigsaw. Leave a slight margin to allow for any slips when chiseling along edges of wing. Next taper the wing as shown in front view in plans and wing sections. This may be accomplished with a small, sharp chisel, or pen-knife. Then round out the wing as shown by wing sections. Sandpaper the whole surface with a coarse grade of paper. Cut out the underneath side of center section with chisel until it fits fuselage snugly as shown in plans. Then cut the two grooves in leading edge of wing where motor nacelles will be inserted. The measurements of these are given by the solid line on top elevation of plan that denotes the part of the motor nacelles above the wing. Go over the wing with fine sandpaper and then draw on

ailerons, pressing heavily so as to make groove.

Make the tail surfaces in the same manner as the wing. Draw outline of tail units on wood and cut to shape with razor blade. Referring to cross-sections, finish them up. Sandpaper thoroughly and draw line separating elevators from stabilizer and fin from rudder.

Make motor nacelles in same manner as fuselage, cutting out side elevation first, then top and then front. Be sure that both pieces are exactly alike and see that they fit neatly into wing. The aft part of these may be chiseled out so as to enclose a retracted landing gear if desired. See cross-sections in lower left hand corner of plans.

Cut the six propeller blades separately from a thin strip of wood with a razor blade. Sandpaper them thoroughly and ambroid (glue) them to two hubs cut from the nose of the motor nacelles with razor blade. Lay the three-bladed props on a flat surface until connections completely dry.

The wheels for the landing gear may be purchased at nearly any model shop.

Cut the four landing gear struts to shape as shown in plans (see true length of struts that join with fuselage in lower right hand corner of plans).

Next make windshields for cockpits and pilot cab, the frames of which may be made of thin strips of wood connected together with ambroid. Isinglass may be used for windows.

Go over all parts of the model once more with fine sandpaper, giving them a smooth surface and making them ready for painting. Several coats of dope will have to be applied in order to get a smooth finish. Paint the fuselage, motor nacelles and landing gear struts olive drab. Paint the wing and tail units yellow, the props silver and rest of model black with the exception of insignia. Paint star white on wing, the circle in center red, and the background blue. Paint black horizontal stripes on rudder red and the vertical one blue, the rest of the rudder white.

When paint has dried begin the assembly. Ambroid wing to top of fuselage. Put blocks under wing tips to hold wing in place. Next connect up the tail units. Be accurate. Join nacelles in place with plen of ambroid. After connections have tho oughly dried, put on the landing ge using plenty of ambroid. Make two t struts and join in place as shown and p on tail wheel. Connect props to nacell using small pins as shafts. Touch up connections with ambroid and dope. T model will then be completed.

List of Entrants in MacRobertson Race

1.	Alan Naish	England	Airspeed Courier
2.	A. O. Edwards	England	D. H. Comet
3.	Col. J. C. Fitzmaurice	Ireland	Bellanca Racer
4.	Mr. & Mrs. Mollison	England	D. H. Comet
5.	T. N. Stack	England	Airspeed AS. 8
6.	H. F. Broadbent	Australia	D. H. Fox Moth
7.	F. Lombardi	Italy	Bergamaschi
8.	Wedell-Williams Air Service	U. S. A.	Wedell-Williams
9.	R F. Lape	U. S. A.	Lockheed Orion
10.	Capt. Molinier	France	Wibault
11.	K. L. M	Holland	Fokker F. XXXVI
12.	K. L. M.	Holland	Fokker F. XXII
13.	K. L. M.	Holland	Fokker F.XVIII
14.	K. L. M.	Holland	Douglas DC-2
15.	Mr. & Mrs. Thaden	U. S. A.	Beechcraft A17.F
16.	Russell Hosler	U. S. A.	Hosler Monoplane
17.	Miss J. Cochrane	U. S. A.	Miller & De Lackner
18.	Laura Ingalls	U. S. A.	Lockheed Orion
19.	R. W. H. Everett	England	D. H. Puss Moth
20.	Societa Idrovolanti Italia	Italy	Savoia-Marchetti
21.	Andre de Sales and Jean Lacombe	France	Bernard 84
22.	Vicomte de Sibour	France	Couzinet
23.	Flg. Off. C. G. Davies	England	Fairey IIIF
24.	H. L. Brook	England	Cabin Miles Hawk
25.	W. J. Cearns	England	D. H. Moth
26.	Bernard Rubin	England	D. H. Comet
27.	Keith-Rider	U. S. A.	Keith-Rider
28.	Jack Wright	U. S. A.	Monocoupe Special
29.	New Guinea Syndicate	Australia	.....
30.	J. Woods and H. C. Miller	Australia	Lockheed Vega
31.	Sir Kingsford-Smith	Australia	Lockheed Altair
32.	Murray B. Dilly	U. S. A.	Vance Flying Wing
33.	Lieut. Lindholm	Sweden	Northrop Delta
34.	Lieut. Hanson	Denmark	Desoutter II
35.	Michel Detroyat	France	Lockheed Orion
36.	Wiley Post	U. S. A.	Lockheed Vega
37.	Dutch Syndicate	Holland	Pander Postjager
38.	Carlos Goetz	Portugal	Comper Kite
39.	V. L. Chandi	India	.....
40.	Ruth Nicholls	U. S. A.	Lockheed Altair
41.	Flg. Lieut. G. Shaw	England	Klemm Eagle
42.	M. Freton	France	Potez
43.	Bleriot-Aeroautique	France	Bleriot
44.	Oliver Nicholson	New Zealand	D. H. Dragon
45.	Alan S. Butler	England	D. H. Dragon
46.	William Courtinay	England	D. H. Gypsy Moth
47.	Sir Alan J. Cobham	England	Airspeed Courier
48.	Lord Nuffield	England	Airspeed Envoy
49.	Lady Cobham	England	Airspeed Envoy
50.	R. K. Dundas	England	Airspeed Courier
51.	James K. C. Baines	New Zealand	Fairey Fox
52.	Lt. H. R. A. Kidston	England	Lockheed
53.	Harold Gatty	U. S. A.	Douglas
54.	Clyde Pangborn	U. S. A.	Gee Bee
55.	Roscoe Turner	U. S. A.	Douglas
56.	Wolf Hirth	Germany	Messerschmitt
57.	Capt. Lyon	U. S. A.	Lockheed Orion
58.	G. R. Pond and C. Sabelli	U. S. A.	Bellanca
59.	Andre Gueit	France	Caudron
60.	Stanley C. Huffman	U. S. A.	Stinson Reliant
61.	Walter T. Varney	U. S. A.	Lockheed
62.	Roy W. Ammel	U. S. A.	General Aviation Tri-mot
63.	David H. P. Clough	U. S. A.	Cessna Monoplane
64.	Salvador Farre	U. S. A.	Percival Gull
65.	Maj. De Seversky	U. S. A.	Seversky 3L

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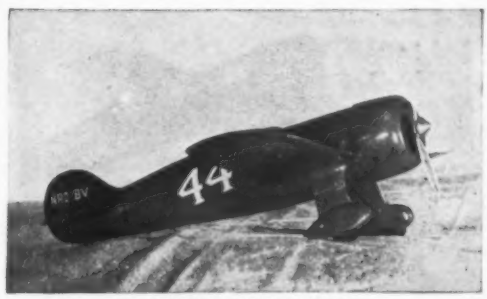

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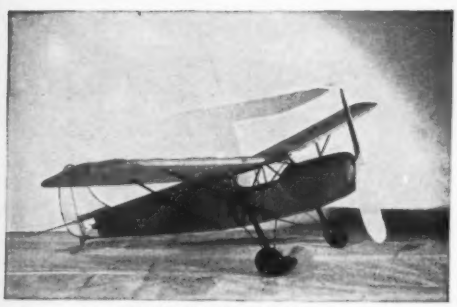

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1/4x1/4 ....6 for .12
1/4x3/8 ....6 for .13
1/4x1/2 ....6 for .14
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3/4x1⅛x8 ..3 for .08
3/4x1⅛x10 2 for .09
3/4x1⅛x11 2 for .11
7/8x1½x8 . 2 for .11
7/8x1½x11 2 for .12
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To thin out your heavier liquids.

2 oz. can.....11
4 oz. can.....18
Pint 70

ALUM. TUBING

1/16 outside diam., per ft. 07
1/8 outside diam., per ft. 07
5/16 outside diam. per ft. 11
1/4 outside diam., per ft. 13

ALUMINUM ITEMS

DRAG RINGS

Used on the real ships for cutting down wind resistance. Makes a beautiful addition to any radial motored model.

1" diam. 19
1½" diam. 19
2" diam. 21
2½" diam. 26
3" diam. 29

6" SOLID SCALE PLANS 4 FOR 10c

S.E. 5 British Scout
Sopwith Dolphin
Col. Rickenbacker's Spad
Pfalz Triplane DR 1

PLANS

24" Flying Model Travel Air "Texaco 13" 25c
Bellanca Pacemaker Flying Scale Model 14" 15c
Lockheed Vega Winnie Mae Flying Scale Model 15".15c
Cabin Tractor ..10c
Twin Pusher ..10c
Puss Moth De Havilland Flying Scale Model 12" 10c
R. O. G. 3 drawing consisting of Sr. R. O. G. Endurance Tractor and high performance R. O. G. printed on one sheet 10

MODEL MAKING PINS, PKG. 5c

TWILL BRUSHES

For finishing models ea. 05

WOOD WHEELS

1" diam. hardwood unbreakable, pair...5c

WOOD VENEER PAPER

For scale model work. Sheet 20x30 .....15c

CLEAR DOPE

This is real nitrate dope thinned down to meet the requirements of model airplane usage.

2 oz. can.....13
4 oz. can.....25
Pint 90

EXTRA THIN TISSUE

Absolutely the lightest covering material known to be had anywhere at any price. Use it for covering your endurance models.

Sheet 20x15 05
Doz. 50

ALUMINUM LEAF COVERING MATERIAL

Newest thing for covering models.

This material is pure sheet aluminum .0003 of an inch in thickness. Think of it, only one tenth the thickness of writing paper. It is light, strong and makes a beautiful covering job. 3½ inches wide, 5 for..... .05

ALUM. 3-BLADE PROP.

Each blade 1¼" long 15

N.A.C.A. COWLINGS

No dummy motor needed when this cowling is used. Has a hole for thrust bearing in the nose.

1½" diam. 19
2" diam. 21
2½" diam. 27
3" diam. 30

COLORED DOPE

Real pigmented aircraft dope. Do not confuse this with dopes of inferior quality. Red, Blue, Black, Yellow, Orange, Olive Drab, Silver. Order by color.

2 oz. can.....15
4 oz. can.....28
Pint 90

INSIGNIAS

U. S. Army and Navy. 4 Stars and 3 Stripes (red, white and blue). 1" sheet 3c; 1½", 4c; 2", 5c; 2½", 6c.

SHEET ALUMINUM

12 inches wide.
.005 per ft.....12
.010 per ft. 19
.003 per ft. 12

THRUST BEARINGS

Strong and light large size.
.035 hole, each ...02
Per doz 20
Small sizes, .025 hole, each 02
Per doz. 20

BAMBOO

Tonkin straight-grained, no-knot bamboo in the following sizes:

1/16x1/4x15 01
Per doz 08
1/32x1/4x8 .....00½
Per doz 04
1/16x1/16x9— doz. 03
1/16 Round x 36 05

SANDPAPER

Large Size Sheet 5c

COLORLESS CEMENT

Absolutely the strongest, lightest and fastest drying colorless cement on the market. Try Some Now!

1 oz. tube.....12
2 oz. can.....17
4 oz. can.....32
Pint 1.00

CELLULOID COMBINATION DRAG RING AND DUMMY MOTOR

1½" diam.....25c
3" diam. 45c

CELLULOID WHEELS

3/4 diam.—pair .06
1 diam.—pair....08
1 3/8 diam.—pr. .11
1 7/8 diam.—pr. .17
3" diam.—pr. 30
Bushings ..4 for .02

DUMMY RADIAL ENGINES

Celluloid, 9 cylinders, 3" diam.
Each 35
1½" diam 20
2" diam. 30

NEWEST TYPE GUNS

Rotary Barrel
¾", 8c; 1⅜", 12c; 1¾", 15c

MUSIC WIRE

Strong, light and stiff. Sizes: .014, .020, .023, .034.
4 ft. packages, 1 ft. lengths 02
Annid. Wire 5 ft. .02

WASHERS

1/8 O. D. Brass for light indoor models. Per doz. 02
1/4 O. D. Copper for outdoor models. Per doz. 02

FREE! OF COST

with each purchase of $1.00 or more, complete kit to build a lifelike replica of

Famous Dirigible LOS ANGELES

with MOORING MAST. Kit includes everything! Send your order NOW!

READ BEFORE ORDERING:

On Orders for Prompt Delivery Please Comply With Instructions Below:

1. Orders under 25c not accepted—due to our very low prices. 2. Add 15c for packing and postage on orders up to $1.50; on orders for $1.51 and over add 10% for packing and postage charges. 3. Add 10c extra to above charges on Balsa plank orders less than $1.50 west of the Mississippi and Canada. 4. Postage stamps, Canadian or Foreign Coin not accepted as payment. 5. Remit by check, postal or express money order. Make payment to MADISON MODEL AIRPLANES, Inc., 134 Livingston Street, Brooklyn, N. Y. 6. Add 5c for insurance against breakage in transit.

Canadian Charges—Add 25c for packing and postage on orders up to $1.50. On orders of $1.50 and over add 15% packing and postage. Postage stamps, Canadian or Foreign Coin not accepted as payment.

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